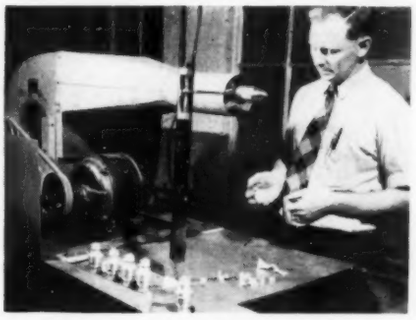
AMERICAN MACHINIST

December 24, 1941



Tunnel Test—*Bomb fuzes, like airplanes, are inspected in a set-up that closely simulates actual conditions*

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VOLUME 85 — NUMBER 26

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Merry Christmas
and a
Happy New Year
AMERICAN MACHINIST

TEETH OF BEVEL AND HYPOID GEARS PRECISION GROUND ON THIS

New Gleason

No. 17 HYPOID GRINDER

FOR GENERATED GEARS AND PINIONS

With the new Gleason No. 17 Grinder, the teeth of hardened curved-tooth bevel and hypoid gears and pinions are now finished by precision grinding many times faster than possible by cutting.

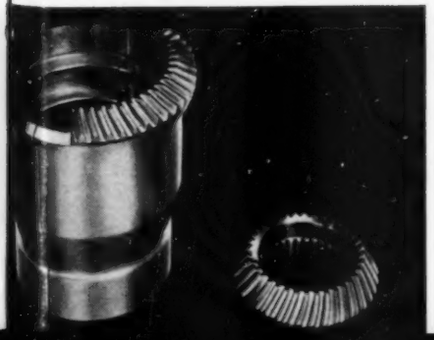
Send prints for complete information on grinding your bevel gears.

ADVANTAGES OF GROUND BEVEL GEARS

Heat-treat distortion corrected . . . all teeth made uniform . . . surface irregularities eliminated . . . tool marks removed . . . tooth profile and fillet blended smoothly into bottom land . . . RESULT—SMOOTHER, QUIETER, LONGER-LIVED GEARS.

SPECIFICATIONS

Cone distance, maximum	12½"
Pitch, coarsest	2½ DP
Whole depth, maximum	¾"
Face width, maximum	2½"
Ratio, shafts at 90	1 to 1—4½ to 1
Wheel diameters	5¾" to 13½"
Feeds, time per pass per tooth	1.9 to 11.8 sec.
Floor space	65¾" x 111¾"



←Ground Spiral Bevel Gears for Controllable Pitch Propeller Unit.

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

1894
1892
THE LODGE & SHIPLEY RECORD
With 19 patented features, Lodge & Shipley lathes were doing work of outstanding accuracy in 1892.
Dietz, Schu.
Cincinnati, O.,
Mechanisms
hence, are in position to offer
to be obtained at a moderate price.
ENGINE-LATHE IMPROVEMENTS.
Independent of Increased Diameters of Cones and Bearings.
DIAMETERS AND LENGTHS may be made without the use of rules or calipers
DIAMETERS REPEATED ABSOLUTELY either in turning or chasing.
also without calipers.
WITHDRAWING THE TOOL reverses the carriage when screw-cutting.
CHANGE GEARS are all steel and mounted on one shaft.
CUTS THE ENTIRE INDEX of screws without removing a single gear and
cuts spirals a duplicate of screw-cutting index.
MOST SUBSTANTIAL in design. Price, just where you can afford it.
GUARANTEED equal to any tool made in accuracy, solidity and workmanship.
SIZES, 18", 22", 26" and 30" for quick delivery.
Write for "25 Points of Excellence," important as above.
THE LODGE & SHIPLEY M. T. CO., CINCINNATI, O., U. S. A.
Do you make Shrink or Force Fits?
MACHINERY
Can be injury to illustrate
16" Screw

Ad from AMERICAN MACHINIST, August 2, 1894

BACK in 1894, at a time when feeds were dependent on belt-driven step pulleys, and threads determined by loose transposing gears, Lodge & Shipley lathes were equipped to give a wide range of threads and feeds—without removing a single gear. The Quick Change method was a milestone in lathe development.

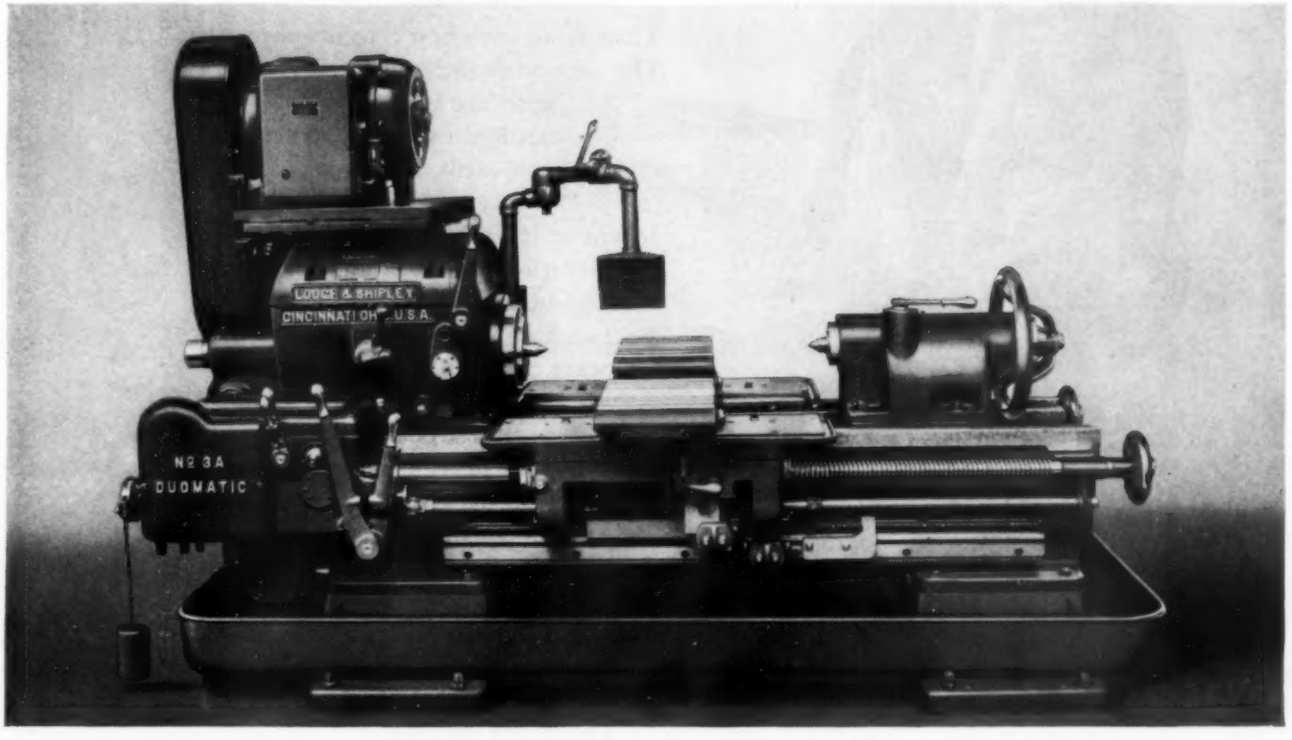
. . and Today

Never in the history of America has the machine tool been of more importance to national safety. Modern Lodge & Shipley lathes are giving a swift, smooth, powerful performance in our manufacturing plants today. You find in these master tools an excellence, a reliability, and accuracy built up through 49 years, dotted with many milestones of lathe leadership.

Lodge & Shipley is giving its best for the defense of America.

since 1892

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A



DUOMATICS mean "more minutes per hour"

ENGINE TOOL ROOM AUTOMATIC LATHES

Christmas Bells

I heard the bells on Christmas day
Their old familiar carols play,
And wild and sweet
The words repeat
Of peace on earth, good-will to men!

And thought how, as the day had come,
The belfries of all Christendom
Had rolled along
The unbroken song
Of peace on earth, good-will to men!

Till, ringing, singing on its way,
The world revolved from night to day,
A voice, a chime,
A chant sublime,
Of peace on earth, good-will to men!

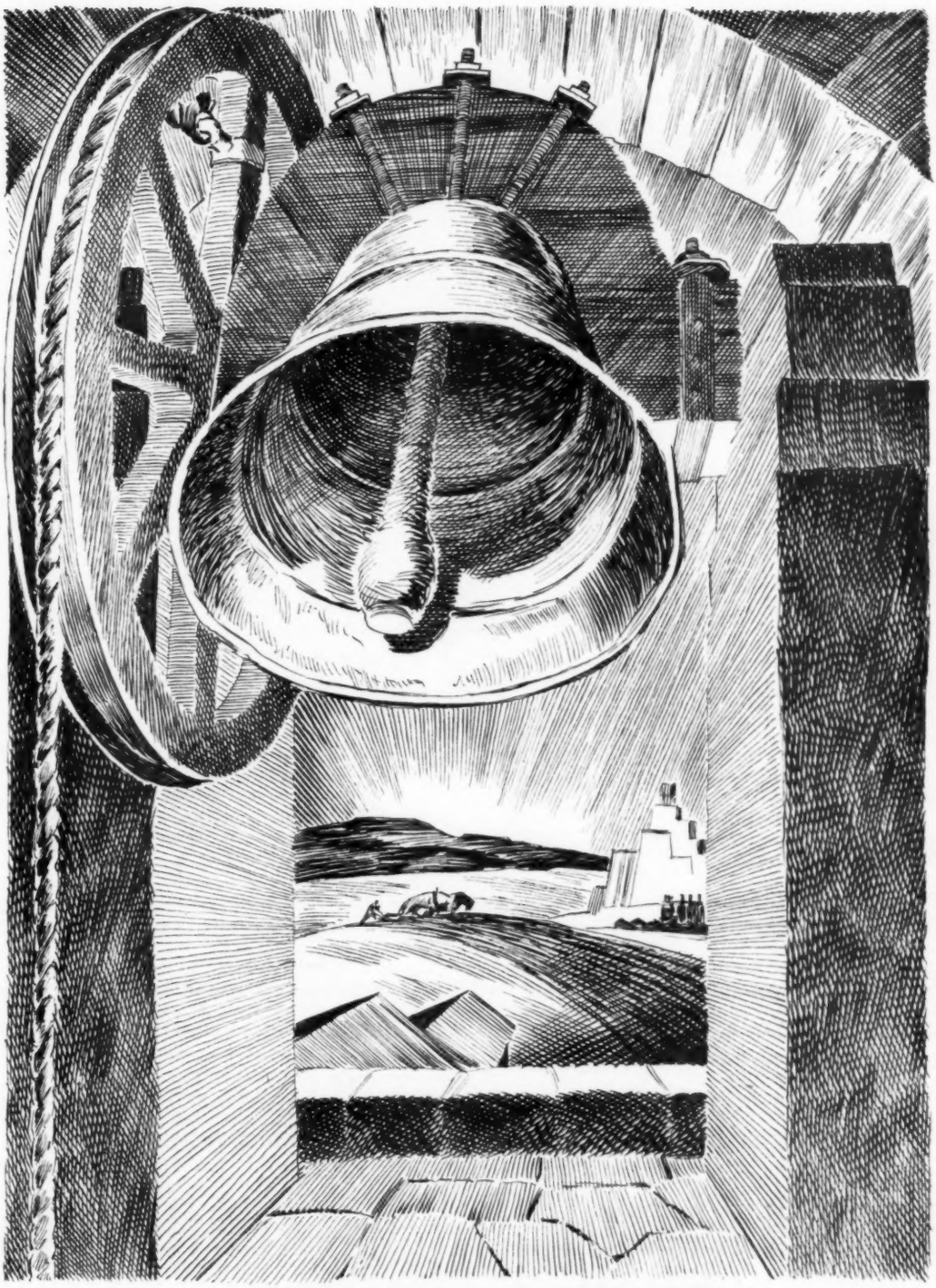
Then from each black accursed mouth
The cannon thundered in the south,
And with the sound
The carols drowned
Of peace on earth, good-will to men!

It was as if an earthquake rent
The hearth-stones of a continent,
And made forlorn
The households born
Of peace on earth, good-will to men!

And in despair I bowed my head:
"There is no peace on earth," I said;
"For hate is strong,
And mocks the song
Of peace on earth, good-will to men!"

Then pealed the bells more loud and deep:
"God is not dead; nor doth He sleep!"
The Wrong shall fail,
The Right prevail,
With peace on earth, good-will to men!

. . . LONGFELLOW



THE WRONG SHALL FAIL---THE RIGHT PREVAIL

The Cincinnati Milling Machine Co.
Cincinnati Grinders Incorporated
Cincinnati, Ohio, U.S.A.

The lion may be the king of beasts, but he won't help chase the rats away

Lion and Tabby are both cats. When the circus comes to town, we're thrilled to see the lions, but day after day around the house it's the familiar cat on which we count to keep the rats away.

Like the lion at the circus, special machinery in the metal working field is limited to a single phase of usefulness.

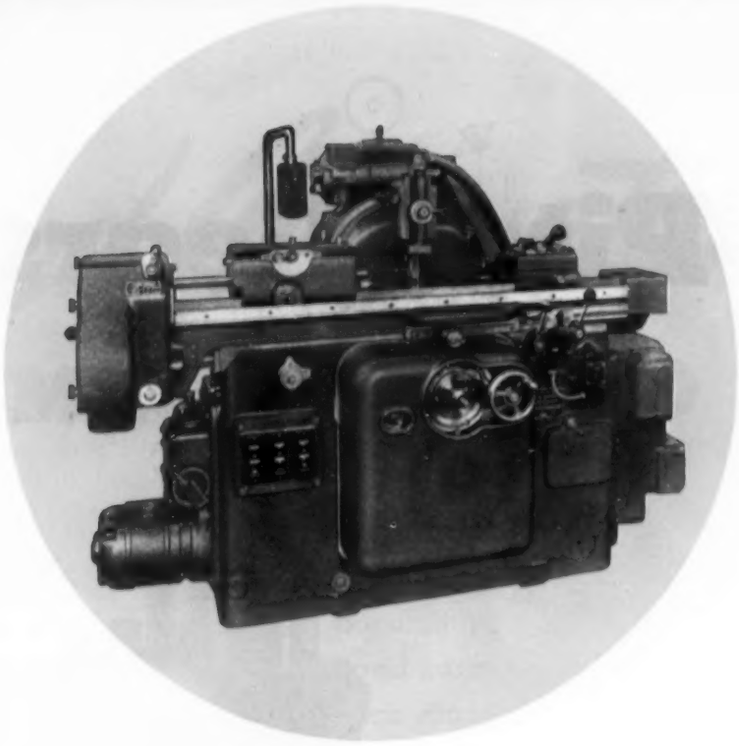
On the other hand, standard, versatile, long-lived, new Jones & Lamson equipment can speed our effort to win this war, and still be quickly and easily converted to peace-time needs.

That is why farsighted management finds that it pays in more ways than one to put production problems up to Jones & Lamson engineers.

JONES & LAMSON MACHINE COMPANY

PROFIT PRODUCING MACHINE TOOLS — **SPRINGFIELD, VERMONT, U. S. A.**

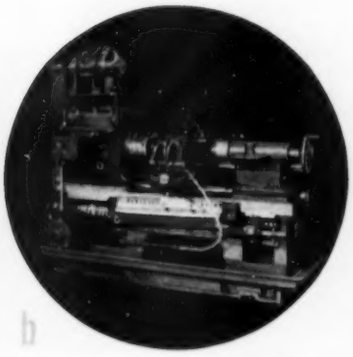
MANUFACTURERS OF: RAM & SADDLE TYPE UNIVERSAL TURRET LATHES . . . FAY AUTOMATIC LATHES . . AUTOMATIC THREAD GRINDING MACHINES . . . COMPARATORS . . . AUTOMATIC OPENING THREADING DIES AND CHASERS.

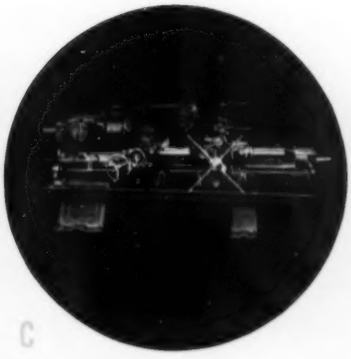


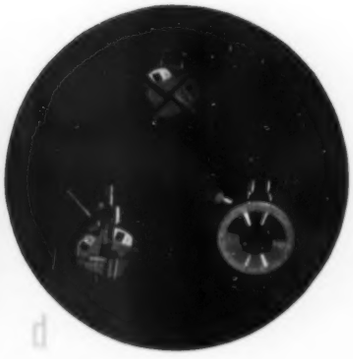
Jones & Lamson Automatic Thread Grinder —Model TG-636

Optical Comparators

Fay Automatic Lathes





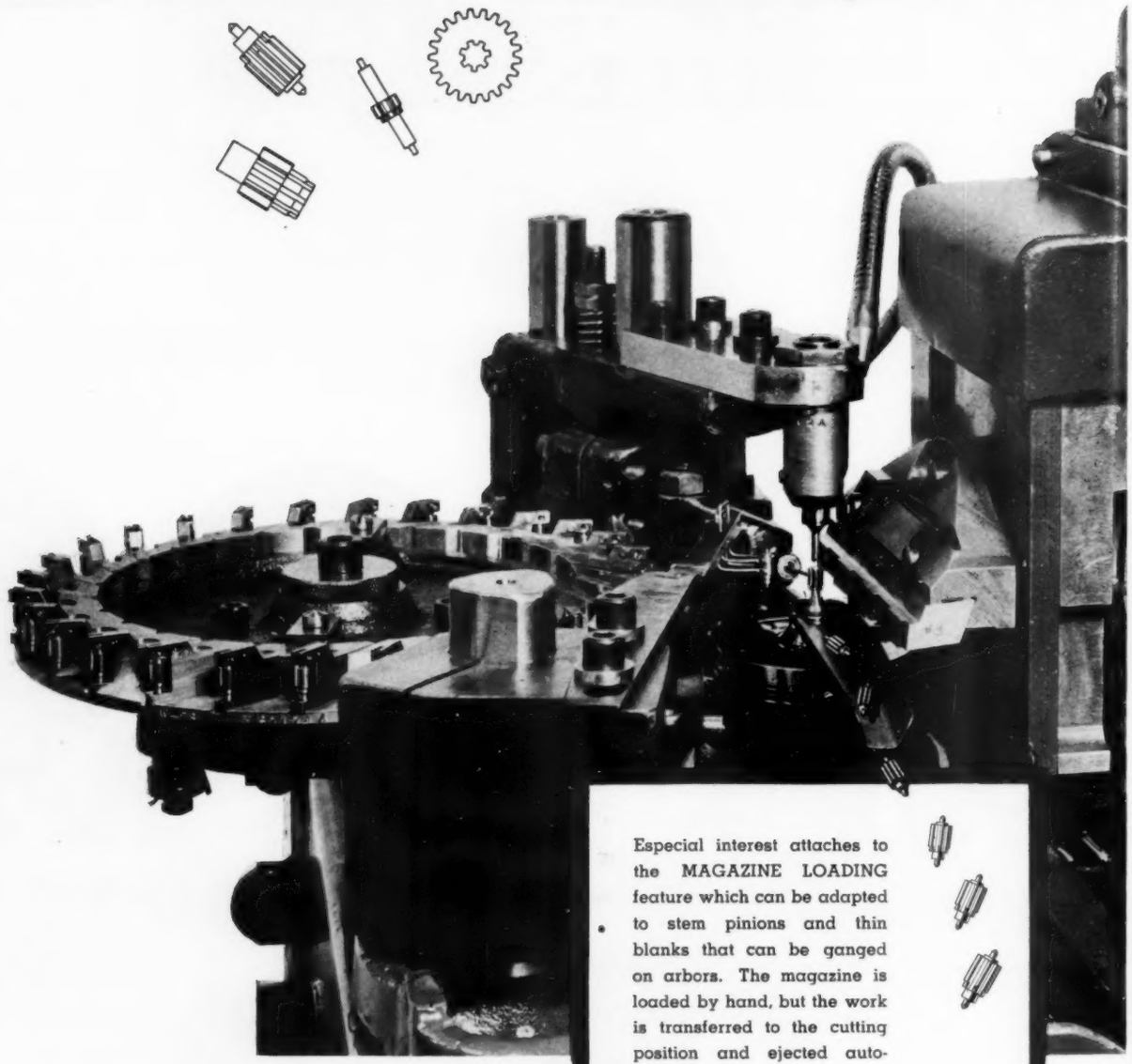


Ram & Saddle Type Universal Turret Lathes

Automatic Opening Die Heads

Grinding threads on a lathe spindle on a Jones & Lamson Automatic Thread Grinder

Fine-Pitch Gears, AND OTHER SMALL PARTS



Especial interest attaches to the MAGAZINE LOADING feature which can be adapted to stem pinions and thin blanks that can be ganged on arbors. The magazine is loaded by hand, but the work is transferred to the cutting position and ejected automatically.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

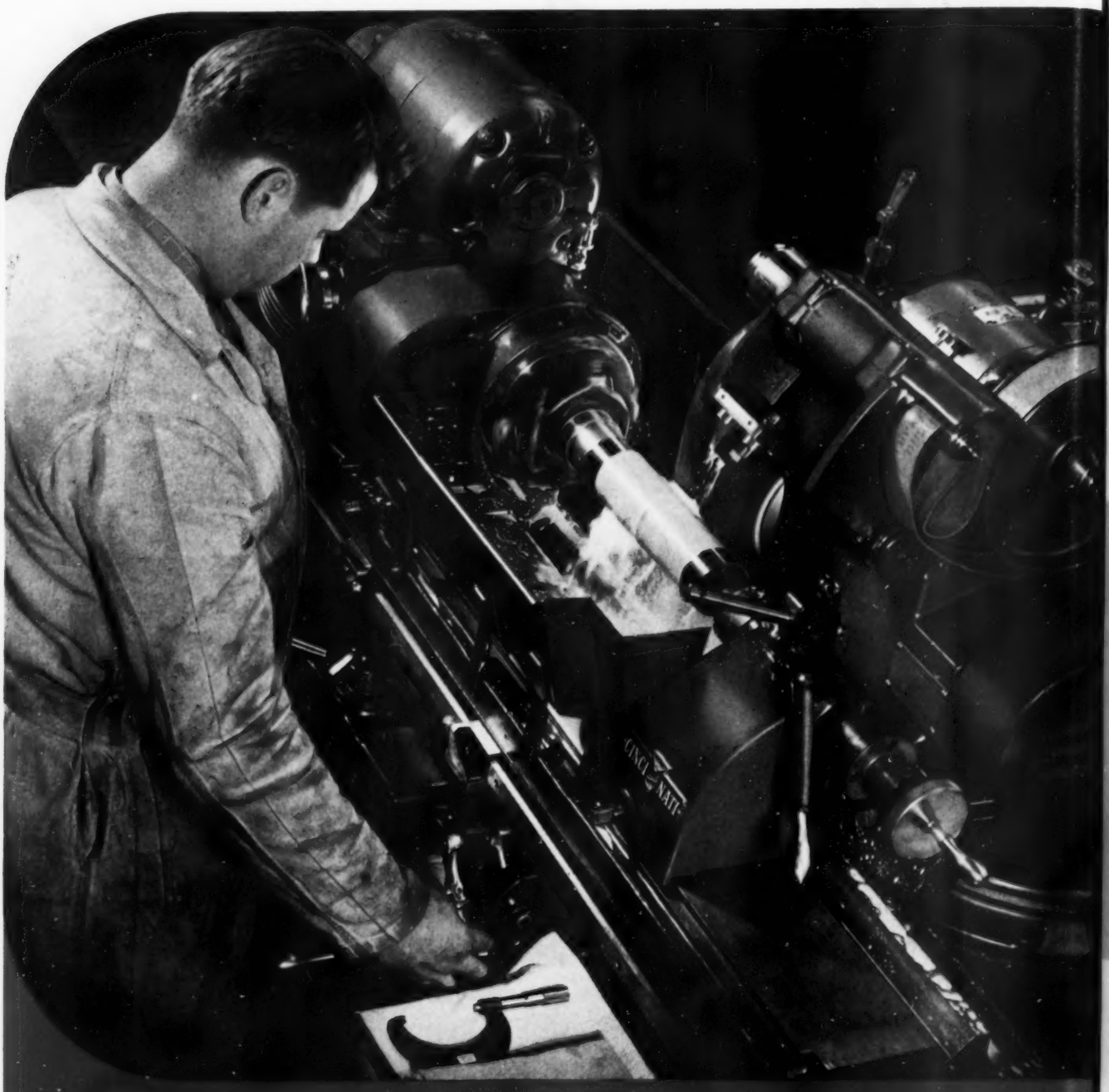
Loaded Automatically
BY MAGAZINE FEED *!*

The new FELLOWS STRAIGHT-LINE GEAR GENERATOR holds intensely interesting possibilities for every manufacturer of small gears and parts. Maximum capacities are 1½-inches pitch diameter for spur gears and 1-inch for helicals . . . Precision is up to the well recognized standard of GEAR SHAPER ACCURACY—but production rates exceed even those of sub-press dies. The cutter slide reciprocates at speeds up to 1500 strokes per minute . . . Here is a new HIGH-SPEED production tool about which you should inform yourself. For a complete description of the machine and its new-type STRAIGHT-LINE CUTTER write The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit,—or 640 West Town Office Building, Chicago, Illinois.

On this STRAIGHT-LINE GEAR GENERATOR the STRAIGHT-LINE tool traverses while the work rotates in step with it.

Method

. . . . FROM BLANK TO FINISHED GEAR



One CINCINNATI Hydraulic Universal will do the work of two machines of an older type, and ordinary operators are able to handle precision work with speed and confidence because these grinders offer many *additional*, standard features that contribute to greater accuracy and faster operation.

SAVE *with a Cincinnati!*

CINCINNATI GRINDERS INCORPORATED

Cincinnati, Ohio U. S. A.

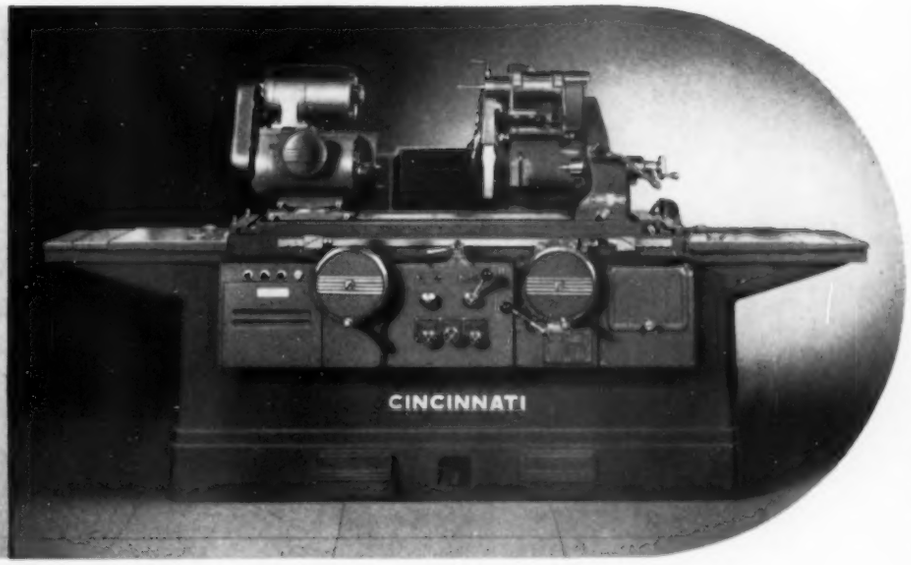
CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES

BUILDING THEM BETTER

than ever before!

● CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings, and between-center distances up to 72". Catalogs G-474 and G-486 giving complete details on all features and their benefits will be sent on request. Write today.

CINCINNATI



● Experience, craftsmanship, the finest materials obtainable and unceasing research are responsible for the high quality and increased usefulness of CINCINNATI Hydraulic Universal Grinding Machines.

In times like these it may seem difficult to maintain unusually high standards, but in spite of ever increasing demands for faster production, CINCINNATI Hydraulic Universals are being built with the same painstaking care that this Company has used since 1884. You may be sure, therefore, that when you purchase a CINCINNATI Hydraulic Universal you are getting the finest grinding machine that human ingenuity and engineering skill has thus far produced. These machines are so accurate a .0001" limit is practical. They give you four major advantages: Faster Set-up, Faster Handling, Faster Grinding and Faster Sizing. Send for your catalogs today!

SAVES SCHEDULING MANY JOBS... KEEPS MILLING WORK "ON THE MOVE"...

Van Norman No. 26 Ram-Type Universal Milling Machine

No need to complicate toolroom and short-run production work by scheduling vertical, horizontal and angular milling jobs to be done on separate machines. Put them all on the same machine . . . the No. 26 Ram-Type Universal . . . and run them off consecutively in any order desired, without changing the original set-up. Save hours of valuable time lost in making jobs "wait their turns." Speed up output. Crack down on errors.

No. 26 simplifies set-up and saves reset-ups by the combined adjustments of the heavy-duty cutterhead . . . which may be repositioned at any point over a range of 90° . . . and the sliding ram which gives added cross-range and permits milling both sides of a job. The operator's task is made easier and less fatiguing by front and rear controls of power feeds, 6-way rapid traverse of table, knee and saddle (also controlled by a single lever both at front and rear), and large dials for easy, accurate reading. No. 26 has the weight and rigidity to take heavy cuts at high speeds, and Van Norman's own standards of high precision wrought deep into every part. Today this machine, like all 5 Van Norman Universals, is a tower of strength in defense work, in plants all over the country. Full details for the asking.

SPECIFICATIONS
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical

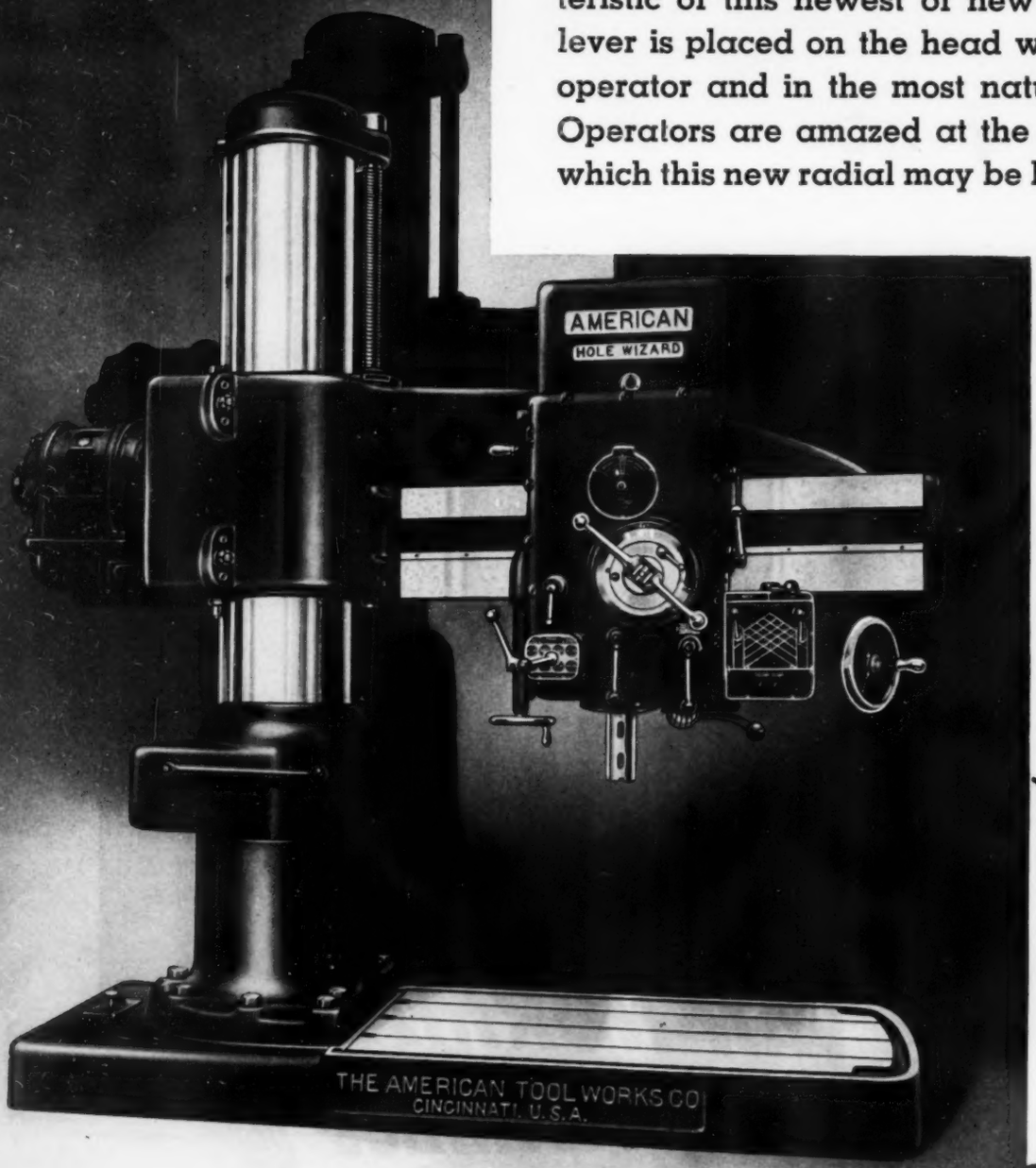
VAN NORMAN MACHINE TOOL COMPANY

SPRINGFIELD, MASS.

VAN NORMAN
Milling Machines

NOT ONLY ALL CONTROLS FROM THE HEAD...

But ALL CONTROLS CENTRALIZED AND MOST CONVENIENTLY LOCATED FOR QUICK AND EASY OPERATION ON THE NEW "AMERICAN" 32 SPEED HOLE WIZARD



Finger-tip control is a real and accomplished characteristic of this newest of new radials. Every control lever is placed on the head within easy reach of the operator and in the most natural operating position. Operators are amazed at the ease and rapidity with which this new radial may be handled.

The direct result of this outstanding characteristic is more holes per hour — less drilling time per piece — greater returns from the pay-roll dollar.

Consult Bulletins #326 and 328 for all the facts.

THE AMERICAN TOOL WORKS COMPANY

Lathes Radials Shapers

CINCINNATI, OHIO, U. S. A.

ACCURACY

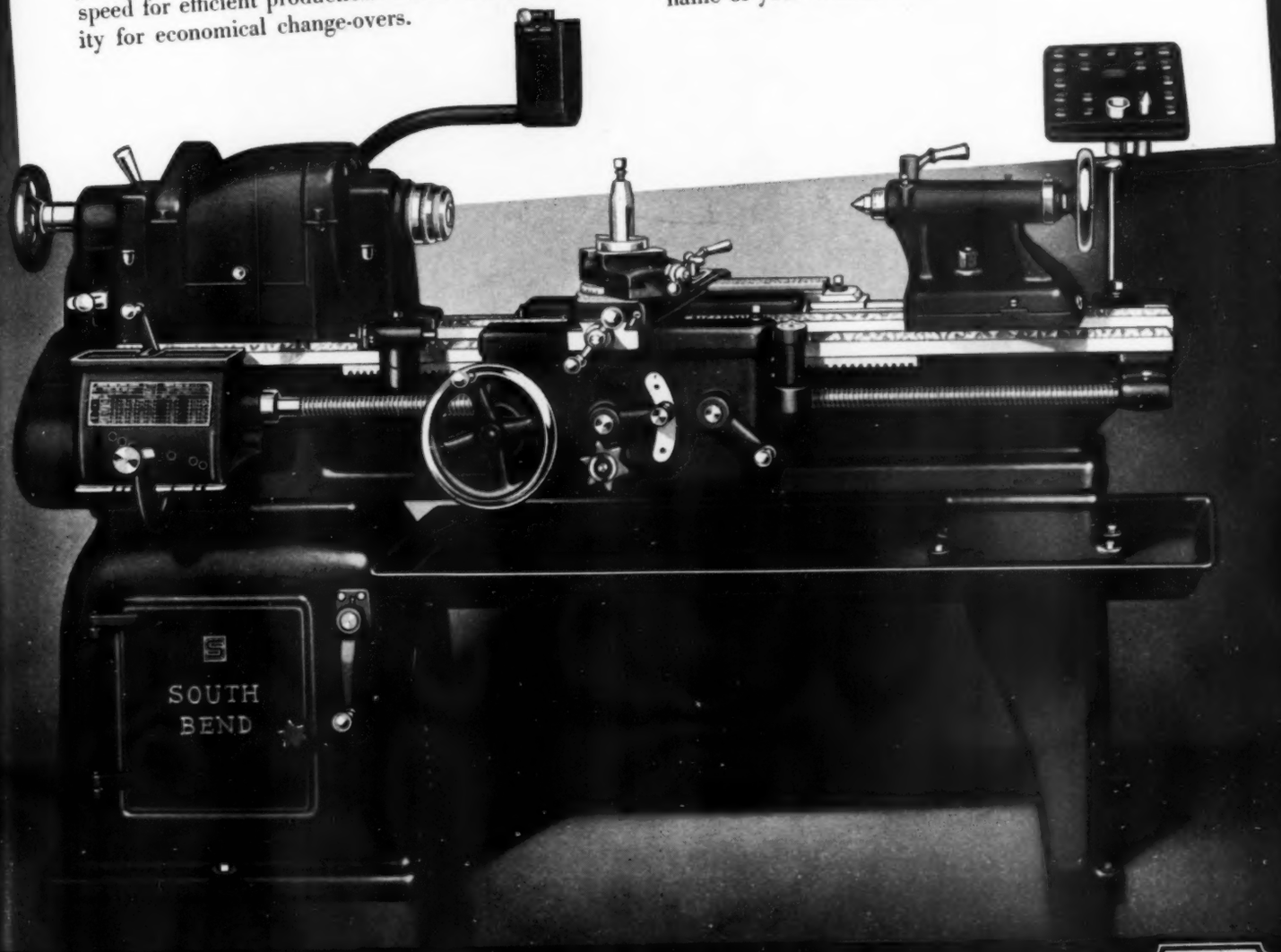
FOR THE FIRST LINE OF DEFENSE

LOOKING at today's whirring defense program, the first picture is that of speed—and tremendous mass production. But behind every such picture there is one of the tool room—the *first* line of defense—where the tools and fixtures for the production line are designed and built. It is in this picture, where measurements are reckoned in split thousandths of an inch, that you will find South Bend Lathes.

Sound design, expert workmanship and quality materials give South Bend Lathes extreme accuracy for precision tool and gauge work—smooth power and speed for efficient production—time-saving versatility for economical change-overs.

It is for these reasons that South Bend Lathes are demanded in ever-increasing numbers by some of the nation's key industrial plants, and by the Army and Navy. The South Bend Lathe Works is prepared to meet the demand—and is meeting it every day—with the same quality, the same high standards which have been maintained through 34 years of fine lathe manufacture.

South Bend Lathes are made in five sizes: 9″, 10″, 13″, 14½″ and 16″ swing, 3′ to 12′ bed lengths, in Toolroom or Manufacturing types, with individual motor drive. Write for New Catalog 100A and the name of your nearest dealer.



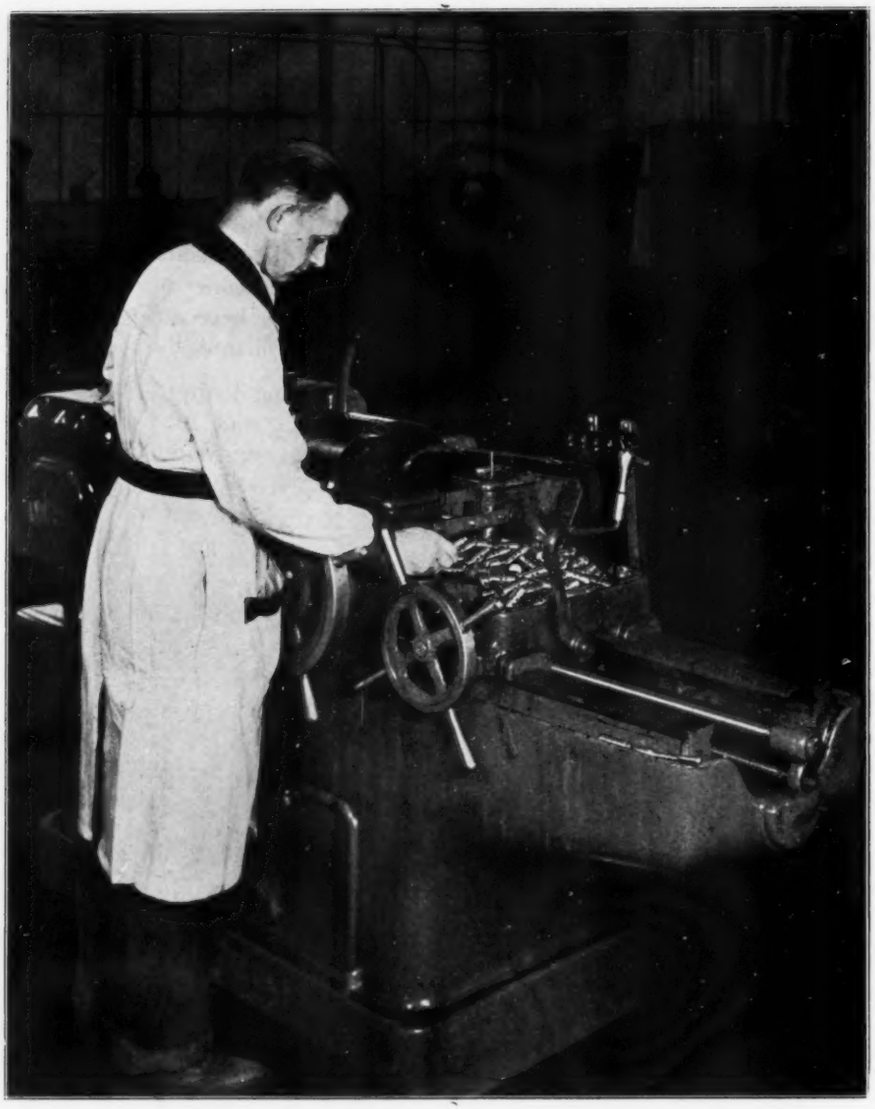
SOUTH BEND LATHE WORKS

959 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

LATHE BUILDERS SINCE 1906

TRADE MARK SOUTH BEND TWIN ENGINE LATHES

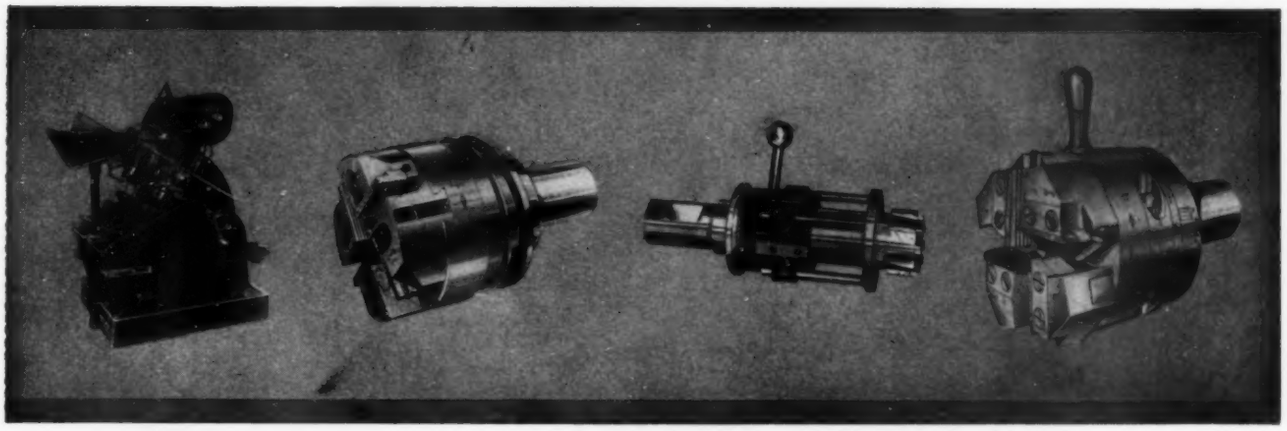
LANDMACO Threading Machines —Step-Up Defense Production



BE THREADWISE—employ LANDIS

LANDIS

MACHINE COMPANY, Waynesboro Pennsylvania

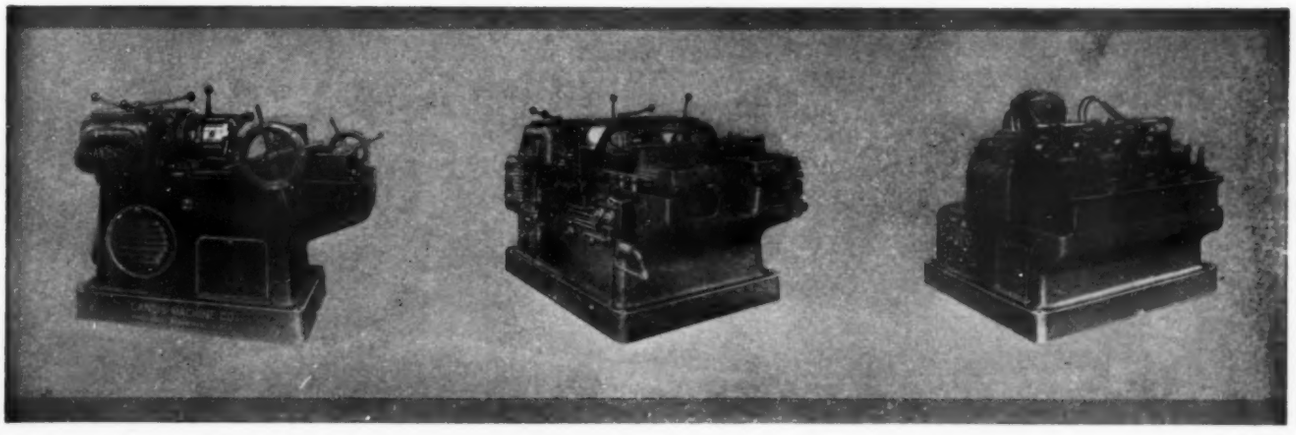


The LANDMACO Threading Machine is setting new Performance Standards everywhere, on Defense Threading Operations.

» LANDMACO Threading Machines are used for threading Cartridge Containers for mortar shells. The threads—5/8" diameter, 18 pitch—must be held within .003" to .005" for concentricity. Futhermore, the threads are cut to close tolerance specifications.

» The LANDMACO Threading Machine produces an average of 335 pieces per hour and 2500 pieces per grind of the chasers. Low threading cost is assured.

Investigate the advantages of employing the LANDMACO Threading Machine for your—National Defense—Thread Cutting Operations.

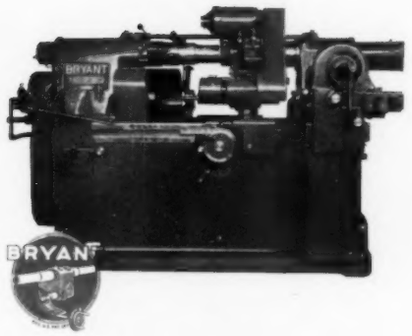


Put in a phone call for Bryant

"Operator, give me long distance — Springfield, Vermont, FIVE - SIX - O: Bryant Chucking Grinder Company — station to station."

When bothersome questions crop up on internal grinding jobs, time and money can often be saved if you put in a phone call for Bryant.

Whether the answer can be given at once in so many words, or whether Bryant can help you more by dispatching bulletins, memos, blueprints or even a service crew to the scene of action, you can count on a prompt response when you put in a phone call for Bryant.



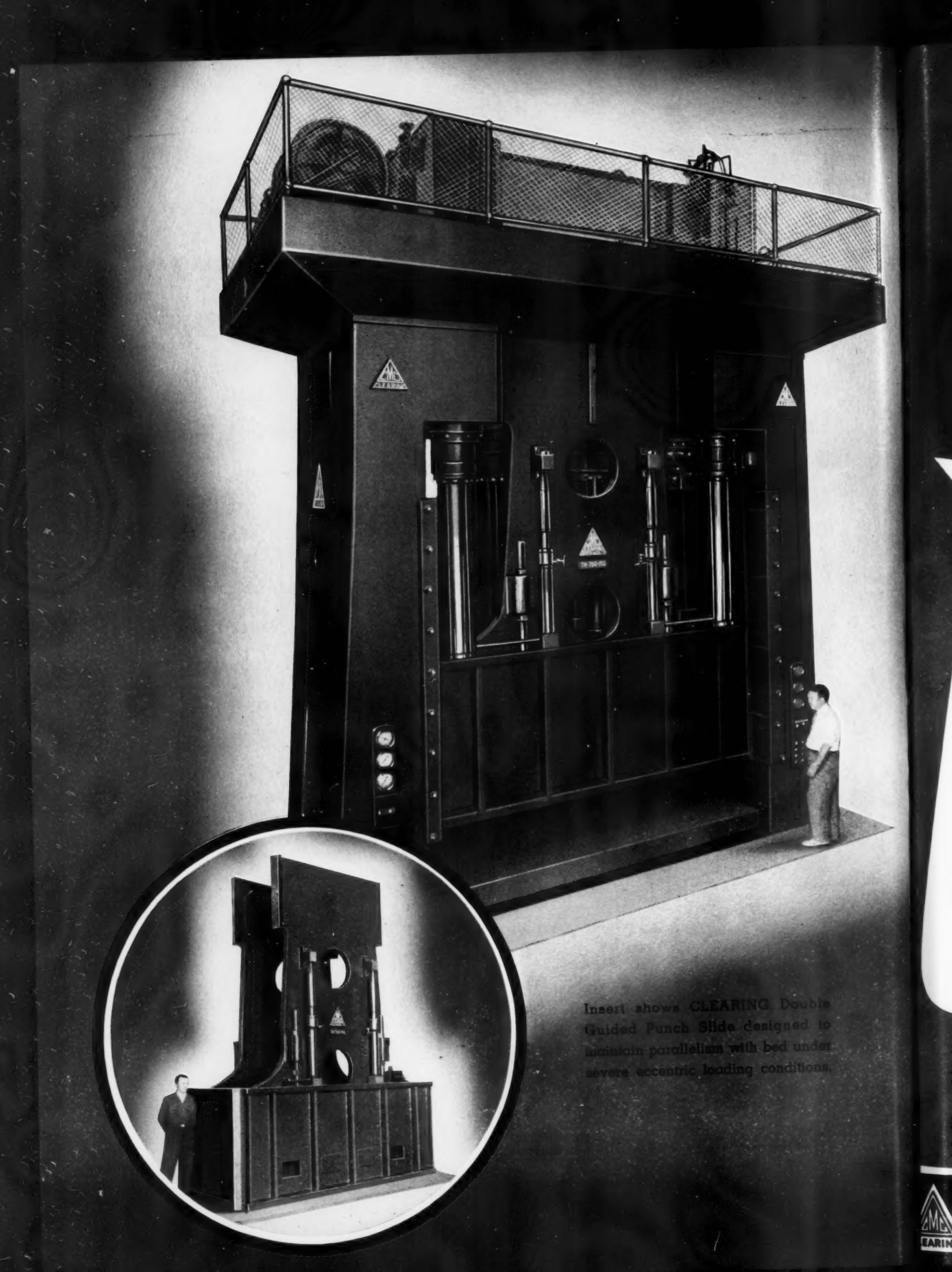
Bryant's productive capacity, already tripled, is constantly increasing. No other organization in America of comparable size and experience is devoted *exclusively* to designing and building machinery for internal grinding work.

Not only should Bryant engineers be able to help you speed defense, but they welcome opportunities to begin work, *at the earliest possible stage* on new products for post-war markets.

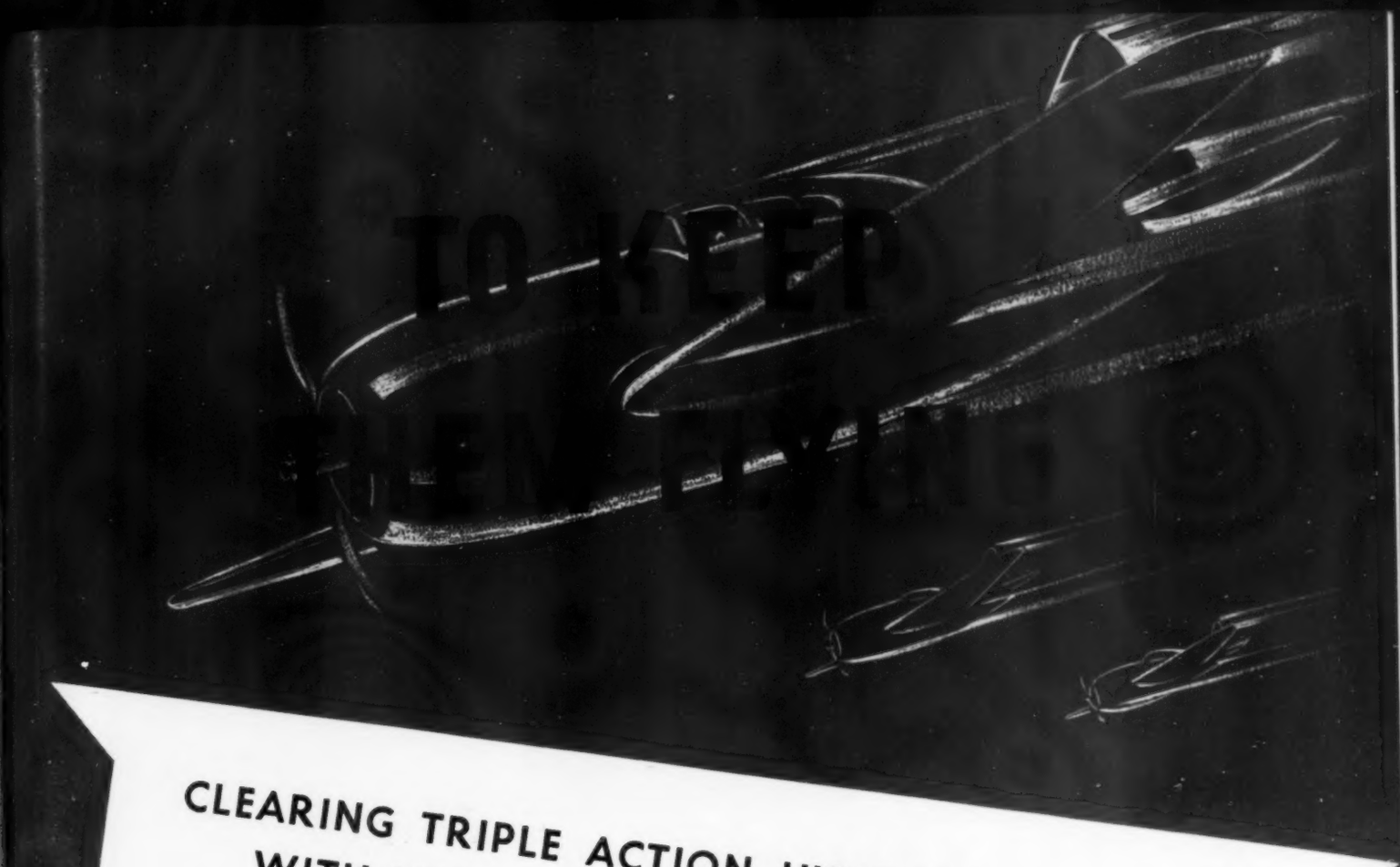
If you believe in planning ahead, put in a phone call for Bryant.

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



Insert shows CLEARING Double Guided Punch Slide designed to maintain parallelism with bed under severe eccentric loading conditions.



CLEARING TRIPLE ACTION HYDRAULIC PRESSES WITH THE DOUBLE GUIDED PUNCH SLIDE FOR PRECISION AIRCRAFT FUSELAGE DRAW WORK

These presses are distinguished by being arranged for every combination of pressing actions, all with fully automatic cycles. They may be adjusted to operate as single action presses for use with rubber pad, or with die cushion. They can be changed quickly and easily to act as double action presses with or without die cushion. By another easy adjustment they will give triple action operation with an upward power stroke by the third action in the bed.

Other outstanding features are: Individually adjustable blankholder pressures in each corner of blankholder, that are controlled from floor level, adjustable length of separation between blankholder and punch, adjustable length of stroke, pressure and speed, and safety features for making press foolproof.

Press illustrated has 1250 ton capacity wtih 400 ton third action with bed area of 150"x72" and a stroke of 66".

Press is installed and operating at the plant of a leading airplane manufacturer.

Consult Clearing Engineers first.

CLEARING MACHINE CORPORATION

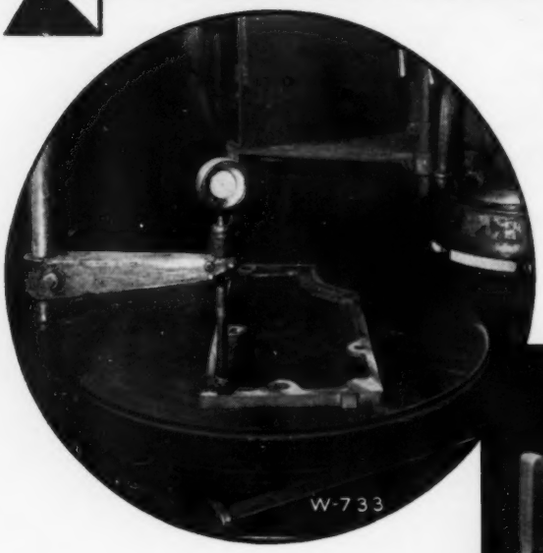
6499 WEST 65th STREET, CHICAGO, ILLINOIS

CLEARING

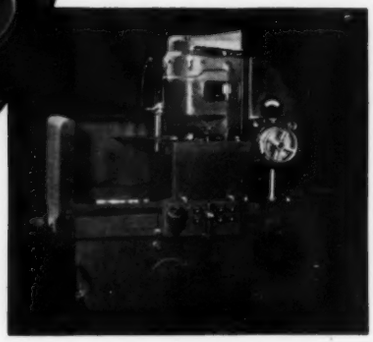
MACHINE CORPORATION

CHICAGO USA DETROIT

"PUT IT ON THE BLANCHARD"



Cast Iron, 30½" x 13" x 1"
Stock per side 1/16"
Limits — must be parallel
Number of Sides 2
2 pieces (4 surfaces) per hr.



Here THE EASIEST WAY IS ALSO THE BEST

This is a difficult job to do any way but on a Blanchard. The piece is of thin section and apt to spring if it is locked in a fixture strongly enough to hold it. The piece is shimmed the first time and a clean-up cut is taken. It is then turned over and a light cut taken on the other side. This operation is repeated four or five times before it is finished.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- **Production**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

TAPER TURNING CAPACITY STEPPED UP BY THE *Phantom Gear*

ASK ANY USER what he thinks of Monarch's Anti-friction Bearing Taper Attachment and Taper Attachment Variator. You'll find that these improvements, pioneered by Monarch, are setting new records for accuracy, smoothness and speed, in turning tapers from 0 to 94 degree included angle . . . qualities not possible on a lathe before the advent of these Monarch devices.

Like other Monarch developments, these practical improvements spring from our desire to maintain our forward march toward more useful lathes. This combination of courage, initiative, open-mindedness and hard work has gained the name, here at Monarch, of "*The Phantom Gear.*" This spirit constantly inspires us to keep Monarch lathes always at the peak of quality, even during the present peak of production.

★ ★ ★

Today, Monarch lathes are at work, day and night, producing implements for National Defense. But, even the terrific grind to which they are being subjected will still leave them, when the emergency is over, ready to keep on producing more goods for more people, at lower cost.

THE MONARCH MACHINE TOOL COMPANY . . . SIDNEY . OHIO

Monarch's March of Progress

Defense industry benefits today from such Monarch improvements as:

Anti-friction bearing taper attachment

Flanged spindle nose

Anti-friction bearing mountings for all rotating parts

Helical geared headstock

Automatic force feed lubrication

Flame-Hardened beds

Automatic sizing for all size lathes

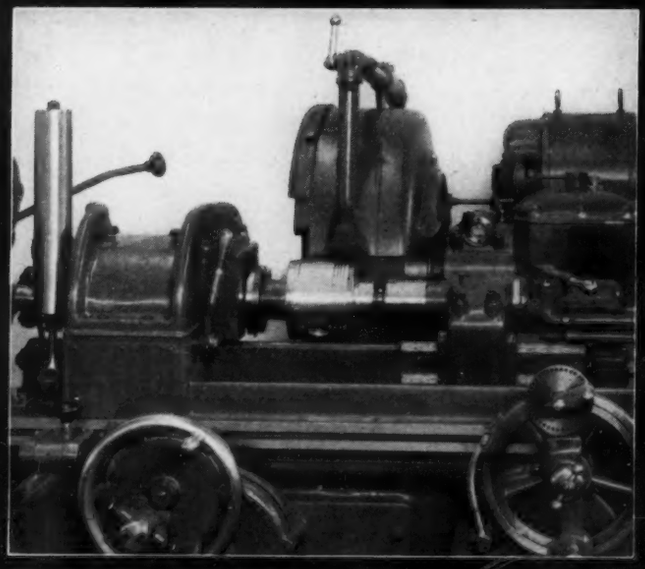
When we return to peacetime production, American industry will continue to gain from *new* Monarch developments. It will pay you to keep in touch with Monarch.

MONARCH LATHES

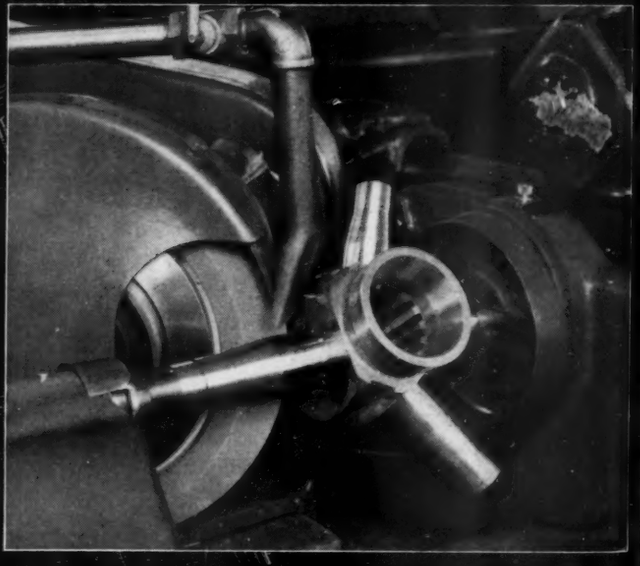
COVER THE TURNING FIELD

"800 Hours Between Overhauls"

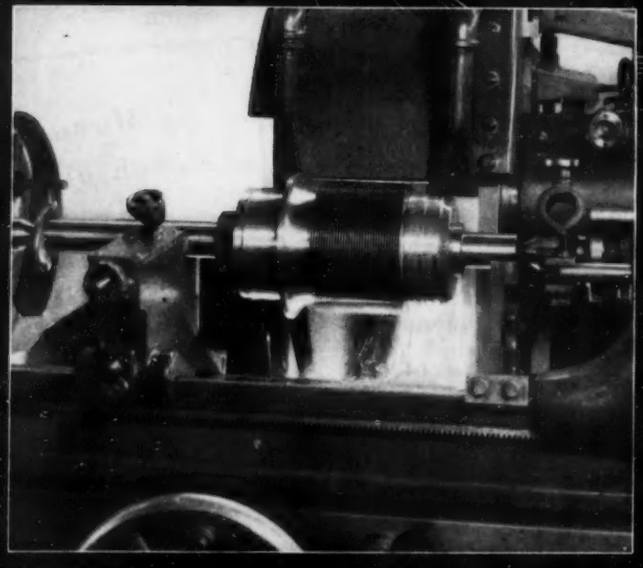
. . . says British Officer of U.S. Airplane Motors



Grinding Piston relief with cam equipment.



Obtaining fine finish on propeller hub spider arm and flange with Angular Wheel Slide Grinder.



Several diameters on cylinder barrels are ground by plunge-cut method.

A Modern Marvel

— *That Owes Much to Grinding*

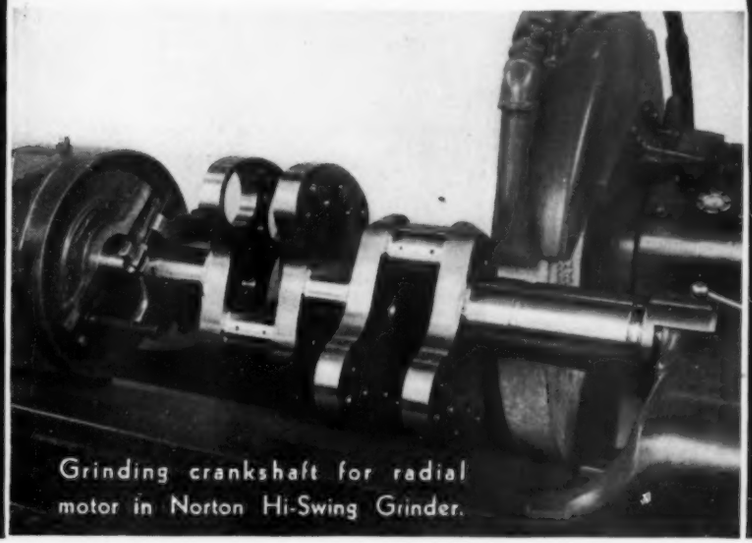
THE U. S. Airplane Motor of this war runs 800 hours between overhauls—to the amazement of the other countries and compared with only 20 to 30 hours for a motor in war service in 1917-18. Moreover, the present motor's horsepower is up to 2000 as compared with 250 in the last war and its weight per horsepower is down to a little over a pound as compared with 2½ pounds.

Truly it is a marvel of engineering development—and a development in which grinding and lapping have played a most important part—providing improved surface finish and dimensional accuracy.

Every airplane motor plant has its batteries of Norton Machines—grinding and lapping crankshafts, pistons, valves, cylinders, cams. The Norton Hi-Swing Grinder for crankshafts is the outstanding favorite of the industry.

The aircraft, as well as other industries, looks to the use of abrasives for improved finishes and high precision.

M-434A



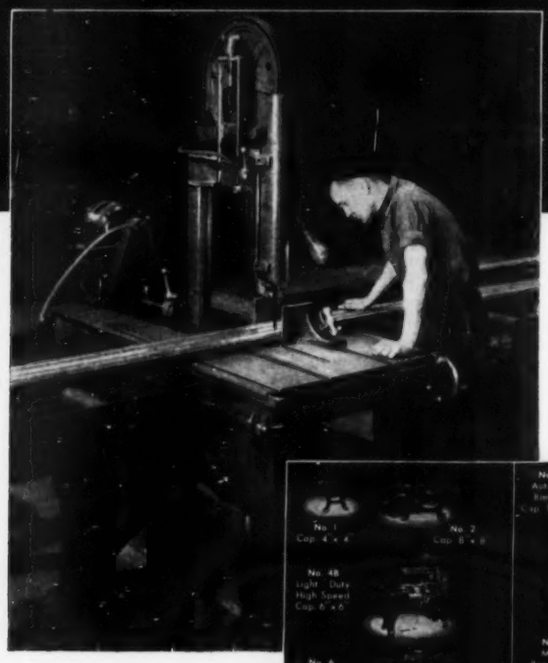
Grinding crankshaft for radial motor in Norton Hi-Swing Grinder.

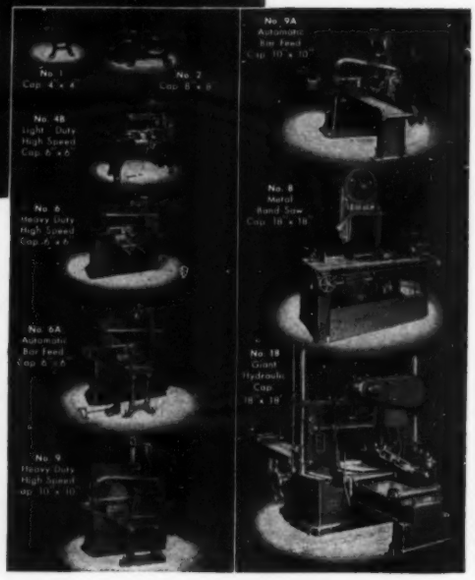
NORTON COMPANY
WORCESTER, MASS.

New York · Cleveland · Chicago · Detroit · Hartford

NORTON
GRINDING MACHINES

MARVEL SAWS





MARVEL SAWS handle orders as they come, at Jones & Laughlin Warehouse

Hot rolled and cold finished steel squares, rounds, hexagons and flats,—single pieces or hundreds of pieces, lengths or slices, small bars or large (to 18" x 18") are cut-off quickly, accurately and efficiently at the Jones & Laughlin Steel Corp. Detroit Warehouse with MARVEL SAWS. "We are very pleased with all machines" sums up their MARVEL experience.

● No. 9A MARVEL Production Saw automatically cutting-off quantity run—3 bars at a time. This heavy-duty all-ball-bearing machine cannot be surpassed in speed, simplicity, ruggedness and dependability.

● A universal No. 8 MARVEL Metal-cutting Band Saw, that cuts-off, miters, notches or cuts at any angle from 45° right to 45° left. Blade feeds into the work.

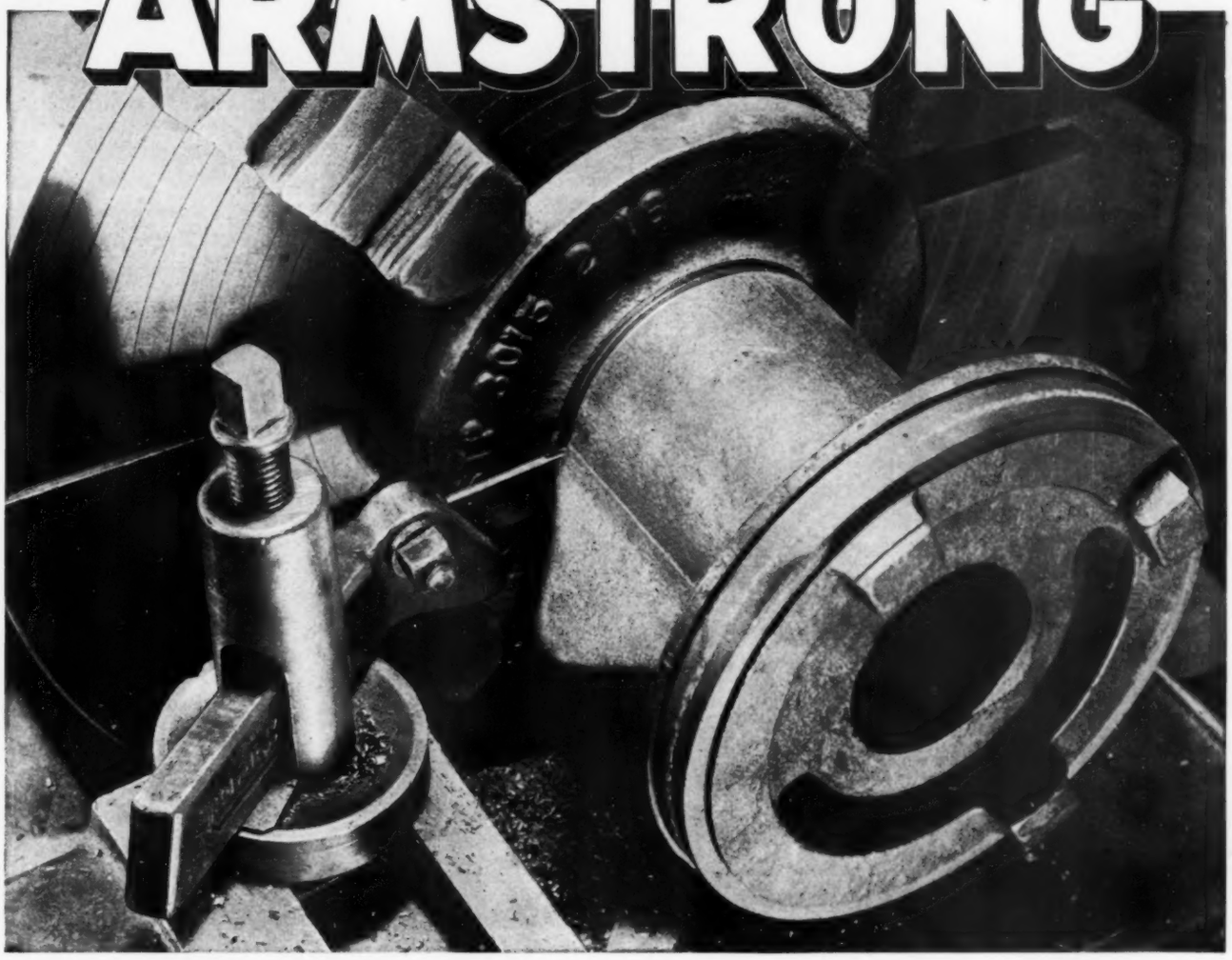
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York

ARMSTRONG



Do the same work with 1/10 the High Speed Steel

Stop wasting critical High Speed Steel by using forged tools for work that can be done more efficiently with ARMSTRONG TOOL HOLDERS. Each ounce of high speed steel in an ARMSTRONG TOOL HOLDER will do the work of 10 ounces in a bar tool. With single ARMSTRONG TOOL HOLDERS replacing complete sets of forged tools, the large amounts of high speed steel tied up in cumbersome single-purpose solid tools or wasted in heavy tool stumps can be saved.

ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to *any* speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% *High Speed Steel.*"

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

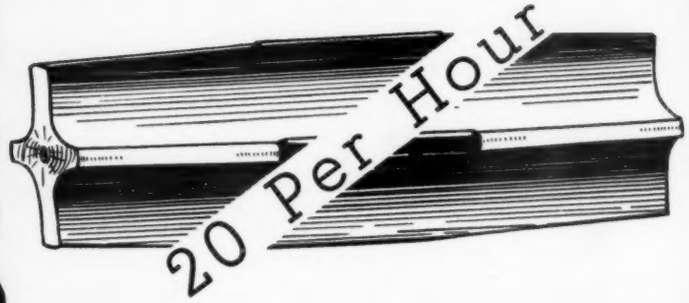
LET PERFORMANCE T

At the plant of a small tool manufacturer 240 of these high speed steel taps are being ground every hour on a Landis 4" Type H Plain machine. Limits on this part are .0005" and .007" stock is removed. The finish is better than required.

A large corporation is using a Landis 4" Type H Plain for grinding the undercut on the end of an airplane valve stem. In spite of the fact that the stems are hollow and the steel is unusually tough, 68 are ground per hour with .050" to .055" stock removed.

A Landis 4" Type H Plain at the plant of a sewing machine manufacturer is being used to grind 2 diameters on shafts like the one shown at left. The production per hour for each end is 150. The shaft is ground within limits of .0005" and .0005" stock is removed.

A Syracuse, New York, company is grinding pipe taps on a Landis 4" Type H Plain machine. Although these taps are made of high speed steel and although .110" stock is removed in the grinding operation the machine grinds both ends, illustrated, at the rate of 20 taps per hour.



PRECISION LANDIS GRINDERS

LANDIS TOOL C

TELL THE STORY

Inner ball bearing raceways like the one illustrated at left are being ground on a Landis 4" Type H Plain in the plant of a well-known ball bearing manufacturer. The machine grinds 130 per hour within limits of .0002" concentricity and .0005" diameter. Stock removal is .005".

Chuck jaws such as the one shown at right are ground on a Landis 4" Type H Plain Hydraulic Grinder in the plant of a large chuck manufacturing company. With the use of a special work holding fixture 250 of these jaws can be ground every hour. The limit on each part is .0005", stock removal is .006".

We could tell you all about the many new and important design features of this modern Landis grinder, the 4" Type H Plain Hydraulic.

We could tell you in great detail about the way it has filled the demand for a speedy machine of small swing.

All this may or may not be of interest to you. But if you are as busy as most executives the one thing of great importance to you and the first thing you would probably ask is—"What Is It Doing On The Production Line?"

Gathered on these pages are six production reports from manufacturing plants throughout the country. Read them.

Then you will agree that performance like this warrants your attention and investigation. And if you would also like to know about the new and highly important design features that make such performance possible — just send for Catalog No. A-41 to the Landis Tool Company, Waynesboro, Pa.

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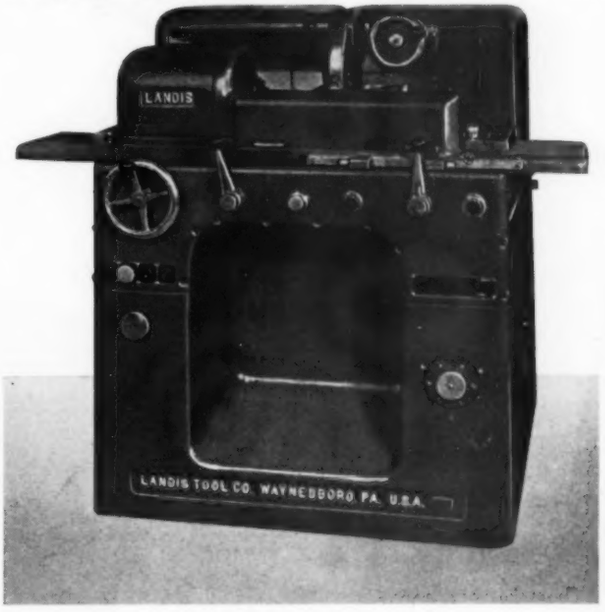


COMPANY

WAYNESBORO
PENNSYLVANIA

Don't Gamble
with your cutting tools

Grind for Maximum Tool Life—

Use the Norton "B-E" Bond Wheel for High Speed Steels and Stellite

YOU can't afford to take chances today on tool grinding — every minute of useful life from every tool is *absolutely essential*. And now the grinding must often be done with help that is not too expert, thus creating another problem.

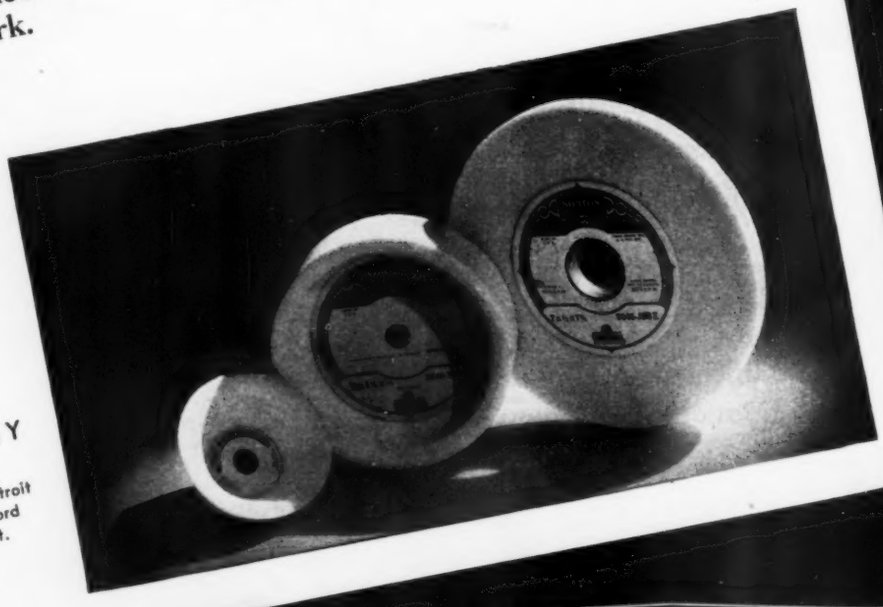
Selecting the grinding wheel need not be a gamble, however. For sharpening cutting tools of high speed steel and the cast alloys such as Stellite the outstandingly popular wheel is the Norton "B-E" bond—as near foolproof as a wheel can be made for this type of work.

Patented "B-E" bond gives a wheel of exceptional strength and exceptional uniformity. It holds its shape and has a crisp, cool grinding action. It gives the tools a keen, long-lasting edge, free from burn.

Its type of construction was developed by Norton research to eliminate the gamble, to reduce the risk of damage in tool sharpening—*and it does just that.*

Call on Norton engineering service for help in making the proper selections for your jobs.

For your cemented carbide tools there are Norton Diamond Wheels (Metal Bonded and Resinoid Bonded) and Norton Crystolon Wheels.



NORTON COMPANY
WORCESTER, MASS.

New York, Philadelphia, Cleveland, Chicago, Pittsburgh, Detroit, Hartford, Hamilton, Ont.

W-846

NORTON ABRASIVES

THESE photos show the operations at three successive stations on an 8-spindle Mult-Au-Matic and illustrate one reason why the Mult-Au-Matic method makes such amazing time savings.

Part of the machining of this aeroplane propeller hub included turning and drilling the arms. This particular operation was divided and 1/3 done on each station, all working simultaneously. Similar divisions of operations, plus a fixture which eliminated time consuming re-chucking, accounted for the balance of the saving.

Bullard engineers can show you how to save time and money with a Mult-Au-Matic on practically any job that can be chucked, even if the quantities are as small as a couple of hundred.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

WINCHESTER REPEATING ARMS USES CLEVELAND MODEL 'B' IN THEIR *Tool Room!*

• *Believe it or not,* Model B high production Cleveland Automatics are used in the tool room at Winchester Repeating Arms Company's plant at New Haven, Connecticut, for production of cartridge case draw punches for small arms ammunition. Because of the high production requirements these draw punches are made in lots of 2000 pieces, and tolerances of plus-or-minus .001″ are held. Both machines on this job have an 18-inch stock feed, making them applicable to many other kinds of production.

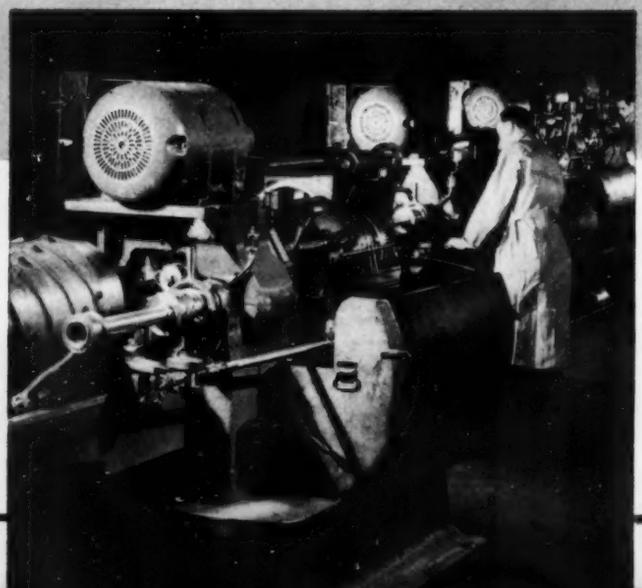
Model B Cleveland Automatics are used throughout industry for metal turning jobs which are simple but where high production is desired. Tap blanks, shafts with multiple diameters, nipples, various types of studs and many other kinds of similar work can be most economically produced on Model B machines.

Built in short and long lengths to accommodate work up to 18-inch stock feed, Model B can be equipped with rotary tilting or hopper magazine attachments for secondary operations. Cutting tools are mounted singly or in series for turning one or more diameters of various lengths. Double cross slides carry forming and cutting-off tools. A bulletin describing Model B specifications will be sent you on request.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 ASHLAND ROAD • CLEVELAND, OHIO

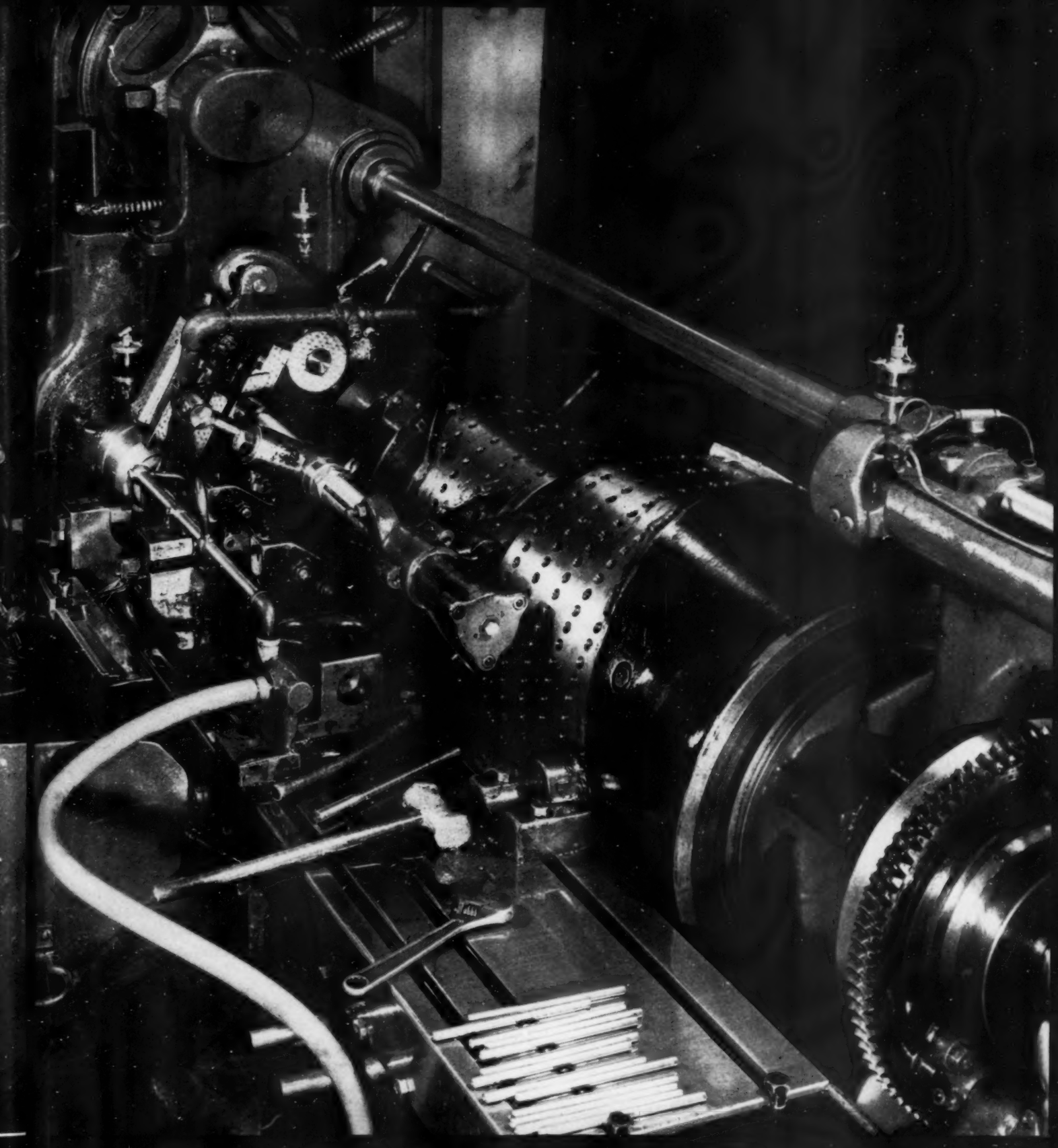
Sales Offices: NEWARK—15 Washington Street • DETROIT—2842 W. Grand Boulevard
CHICAGO—565 West Washington Street • CINCINNATI—507 American Building



Here at left are three of the 26 Model B, 18-inch Cleveland Automatics used by Packard Motor Car Co., Detroit, Michigan in manufacture of engine studs for Rolls Royce aircraft engines.

WINCHESTER

Photographed through the courtesy of
WINCHESTER REPEATING ARMS CO.
Division of Western Cartridge Co.,
New Haven, Connecticut



CLEVELAND

MODEL B *Single Spindle* AUTOMATIC

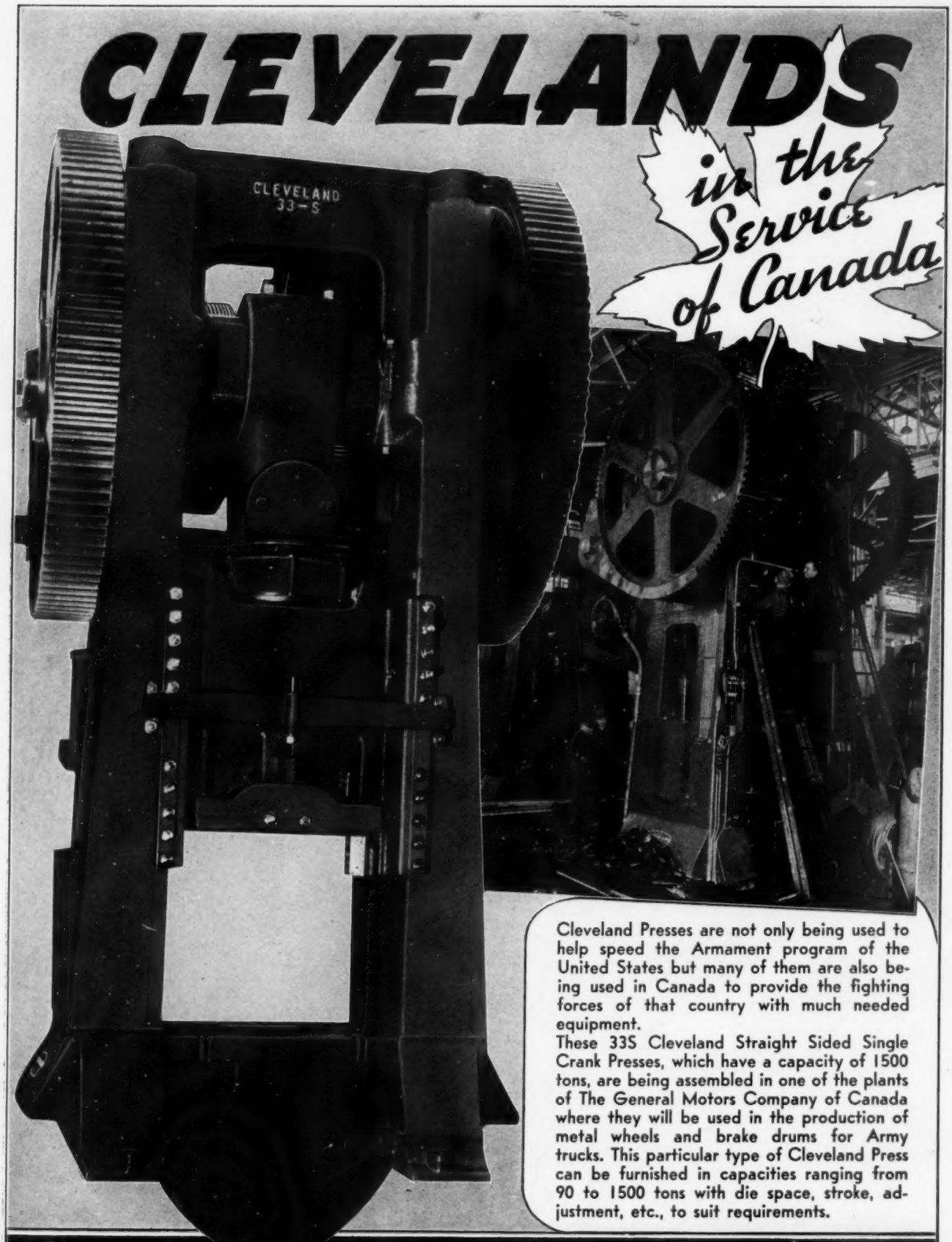
MODEL B—Built in 9/16-inch to 2 1/2-inch capacities inclusive

MODEL A—Built in 9/16-inch to 8-inch capacities inclusive

MODEL AA—Built in 1 1/16-inch and 1 3/8-inch capacities only

CLEVELANDS

in the Service of Canada

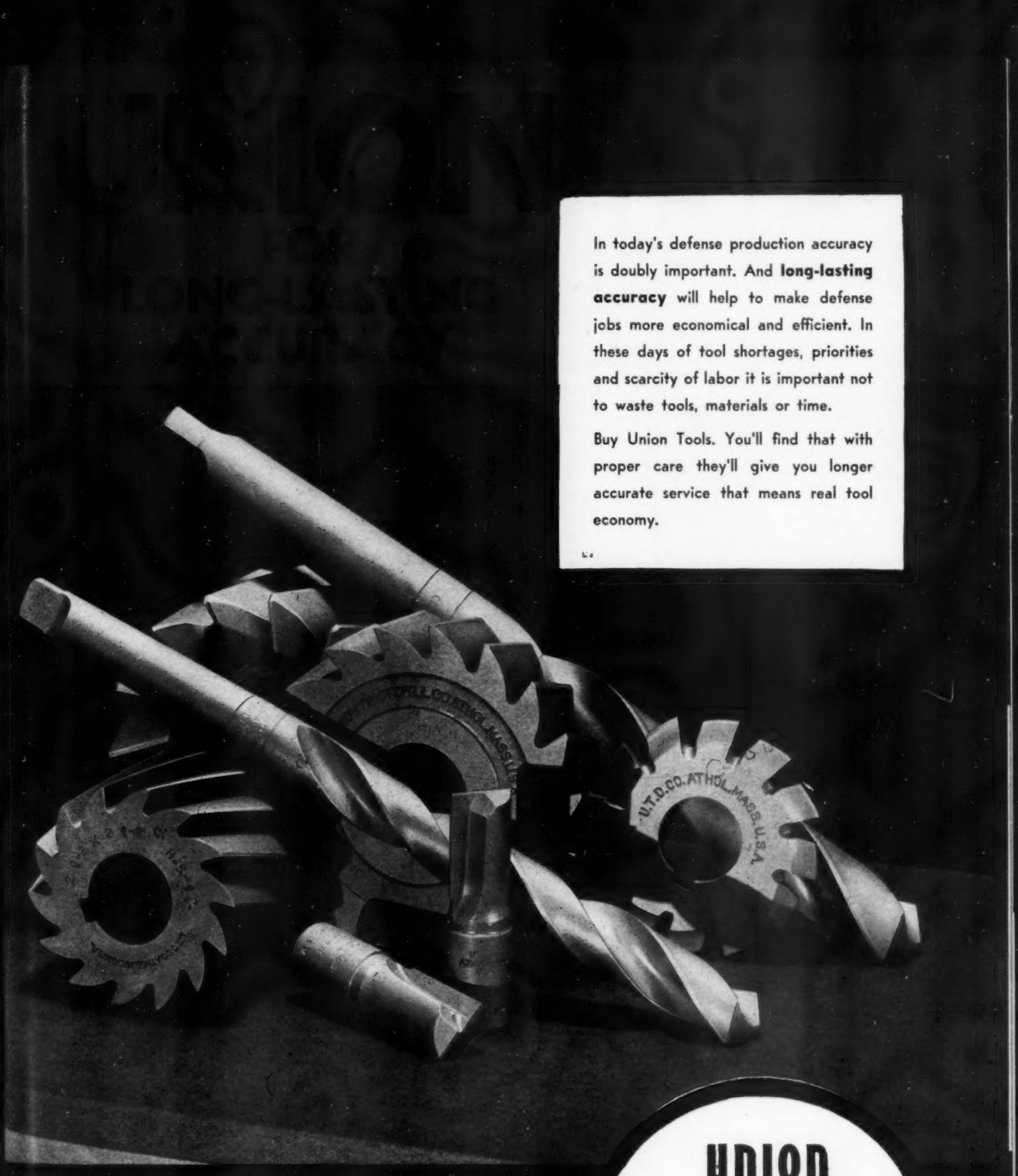


Cleveland Presses are not only being used to help speed the Armament program of the United States but many of them are also being used in Canada to provide the fighting forces of that country with much needed equipment.

These 33S Cleveland Straight Sided Single Crank Presses, which have a capacity of 1500 tons, are being assembled in one of the plants of The General Motors Company of Canada where they will be used in the production of metal wheels and brake drums for Army trucks. This particular type of Cleveland Press can be furnished in capacities ranging from 90 to 1500 tons with die space, stroke, adjustment, etc., to suit requirements.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH



In today's defense production accuracy is doubly important. And **long-lasting accuracy** will help to make defense jobs more economical and efficient. In these days of tool shortages, priorities and scarcity of labor it is important not to waste tools, materials or time.

Buy Union Tools. You'll find that with proper care they'll give you longer accurate service that means real tool economy.

DIVISIONS of the UNION TWIST DRILL COMPANY

UNION
BUTTERFIELD
S. W. CARD

CARD

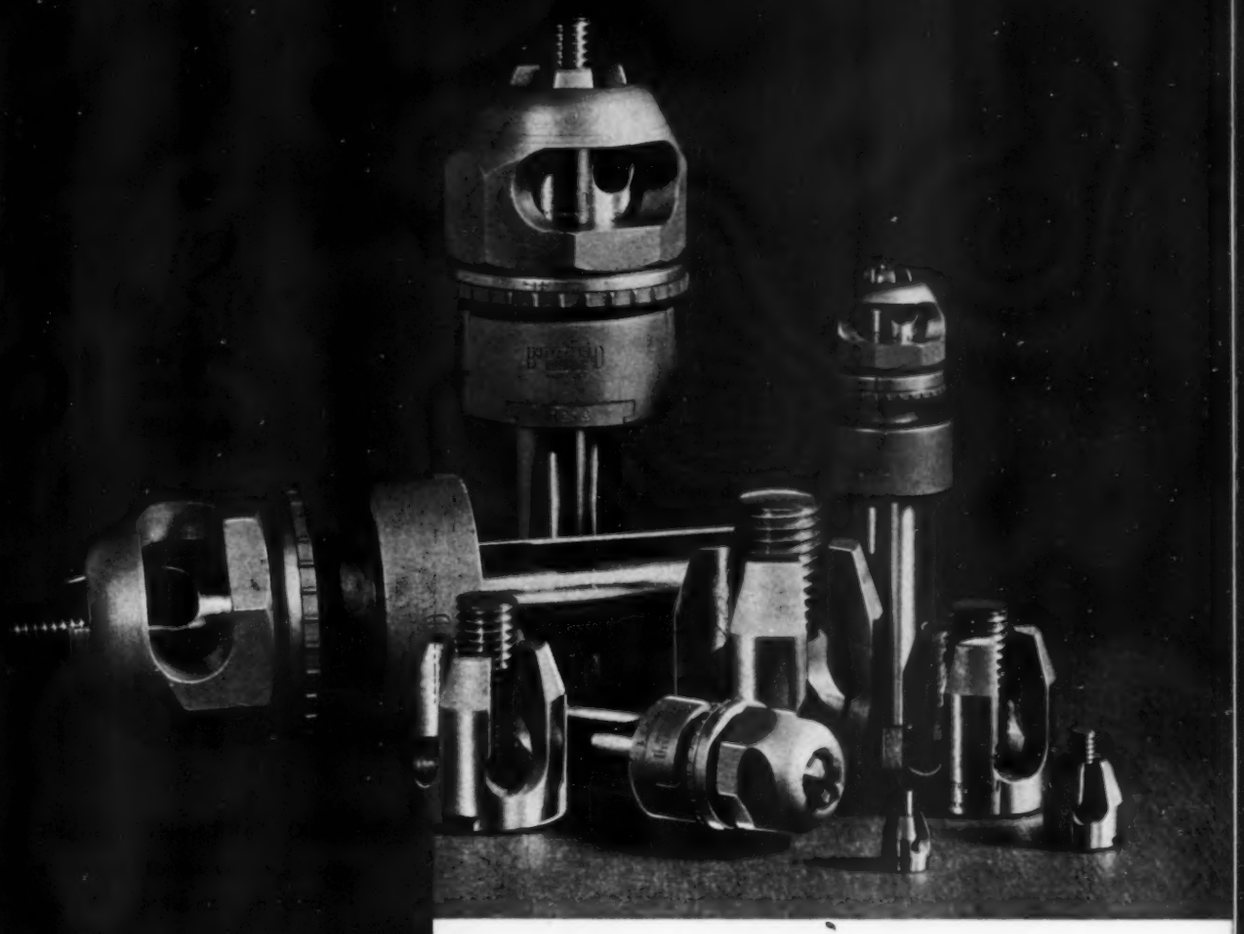
We have often urged tap users to prove Card Quality by putting Card Taps to work on their most difficult operations. Present Defense production demands are giving Card Taps the severest kind of Service Test . . . and the results which they produce are excellent proof of the stamina and accuracy built into every tap bearing the Card name.

S. W. CARD MFG. CO. **MANSFIELD, MASS., U. S. A.**

The CARD Quality

UNION
BUTTERFIELD
S. W. CARD

DIVISIONS of the UNION TWIST DRILL COMPANY

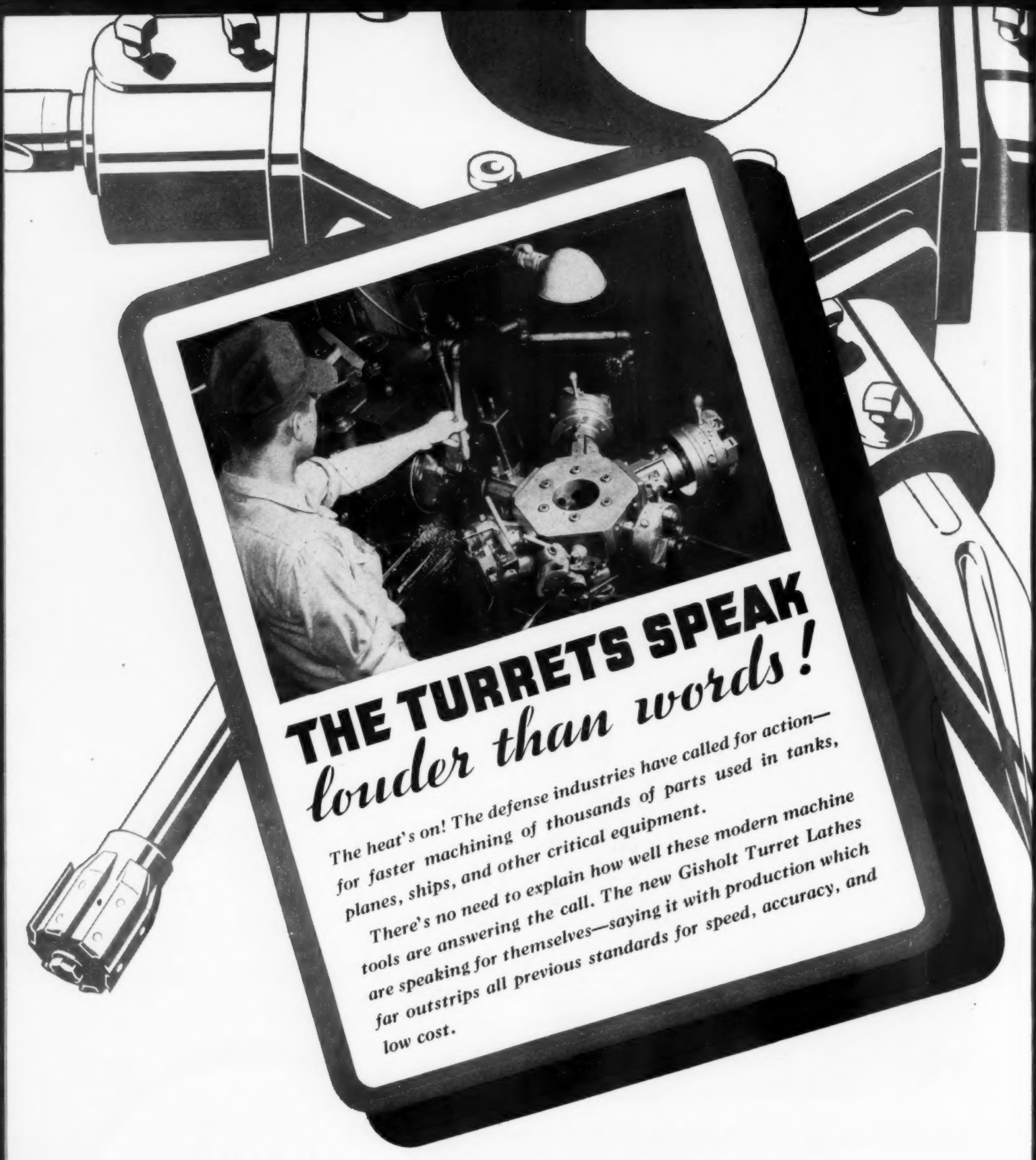


Butterfield

DIVISION
DERBY LINE, VT.
ROCK ISLAND, QUE.

DIVISIONS of the UNION TWIST DRILL COMPANY

UNION
BUTTERFIELD
S. W. CARD



THE TURRETS SPEAK *louder than words!*

The heat's on! The defense industries have called for action—for faster machining of thousands of parts used in tanks, planes, ships, and other critical equipment.

There's no need to explain how well these modern machine tools are answering the call. The new Gisholt Turret Lathes are speaking for themselves—saying it with production which far outstrips all previous standards for speed, accuracy, and low cost.

Look ahead . . . keep ahead . . . with Gisholt improvements in metal turning

GISHOLT

GISHOLT MACHINE COMPANY

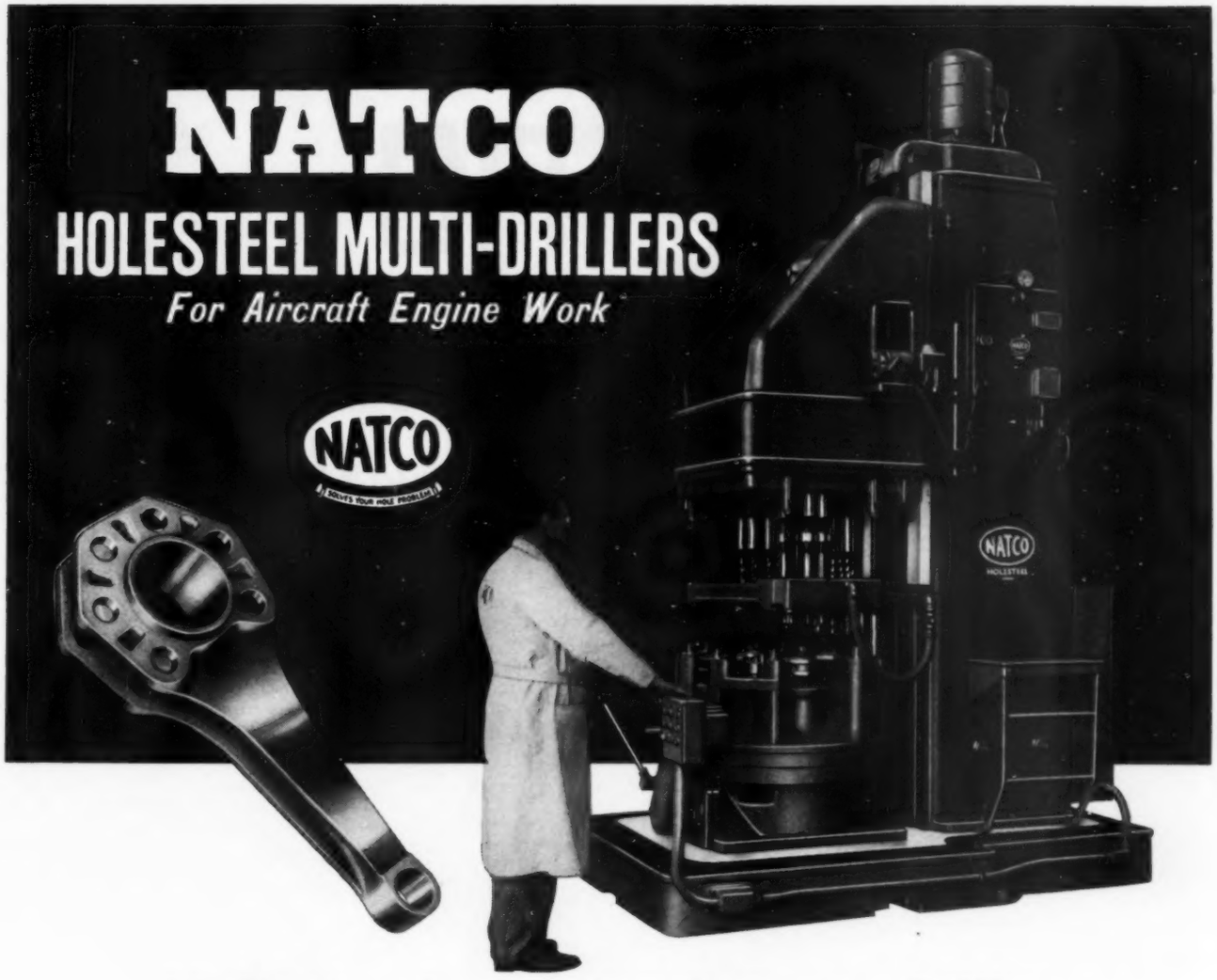
1201 EAST WASHINGTON AVENUE • MADISON, WISCONSIN

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

NATCO

HOLESTEEL MULTI-DRILLERS

For Aircraft Engine Work



27 Master Connecting Rods are Drilled and Reamed on this NATCO Holesteel Machine

36 drilling, core drilling, and reaming operations are being performed on 27 connecting rods per hour by the machine shown above. It is a NATCO model B-3A Heavy Duty Fixed Center Multi-Driller. It has a spindle box containing 18 drilling spindles complete with nose adjustment, and the hydraulic feed is arranged with a jump feed mechanism permitting the tools to rapid traverse to the second cheek in the part after the tools have penetrated the first cheek.

The fixture, a 4-position type is arranged to hold one master rod in each position. It is mounted on a 36″ diameter, 4-position hand crank, indexed rotating table, and as the parts are indexed from one position to another, the 36 operations are performed.

This is another example of NATCO HOLESTEEL Vertical Machines applied to aircraft engine work. These machines are built in a variety of sizes and capacities, and will stand up against hard usage over long periods with little maintenance expense. Write for literature or call one of our field engineers for advice on your drilling, boring and tapping problems. His viewpoint may help your engineers in reducing your drilling, boring and tapping costs.

NATCO Advanced Engineering
Plus Quality Construction
Recognized For Many Years
The World Over

THE NATIONAL AUTOMATIC TOOL COMPANY
Richmond, Indiana, U.S.A.

Chicago Office: 1809 Engineering Building
Detroit Office: 409 New Center Building

Investigate NATCO Methods for the Lowest Possible Hole Costs!

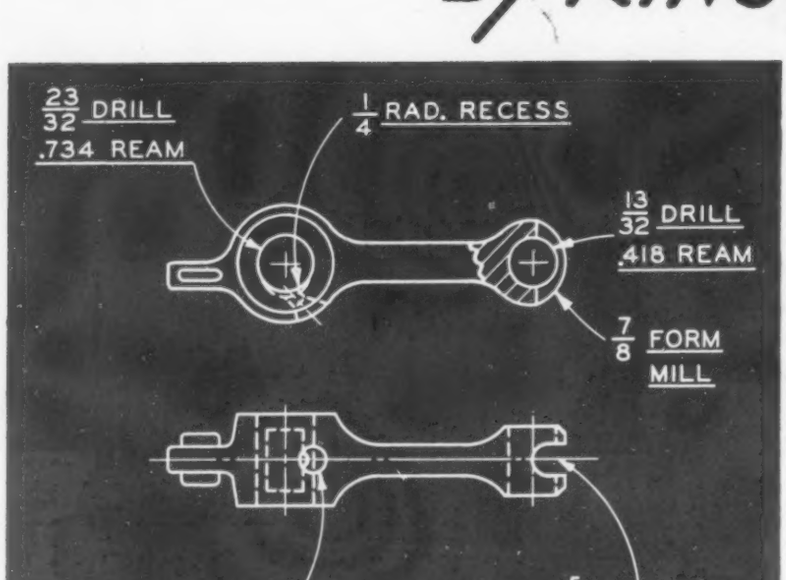
NATCO

SOLVES YOUR "HOLE" PROBLEM

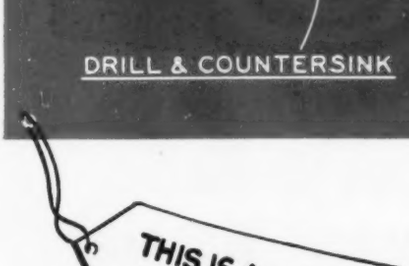
Producing connecting rods on a

FLEXIMATIC

by KINGSBURY assures fast work on intricate parts



Drilling, reaming, recessing and milling forged-steel connecting rods for a refrigerator unit are handled in a single chucking of the work on this Model GH FLEXIMATIC. A unique operation on this job is the milling of the oil recess with a two-direction spindle movement.



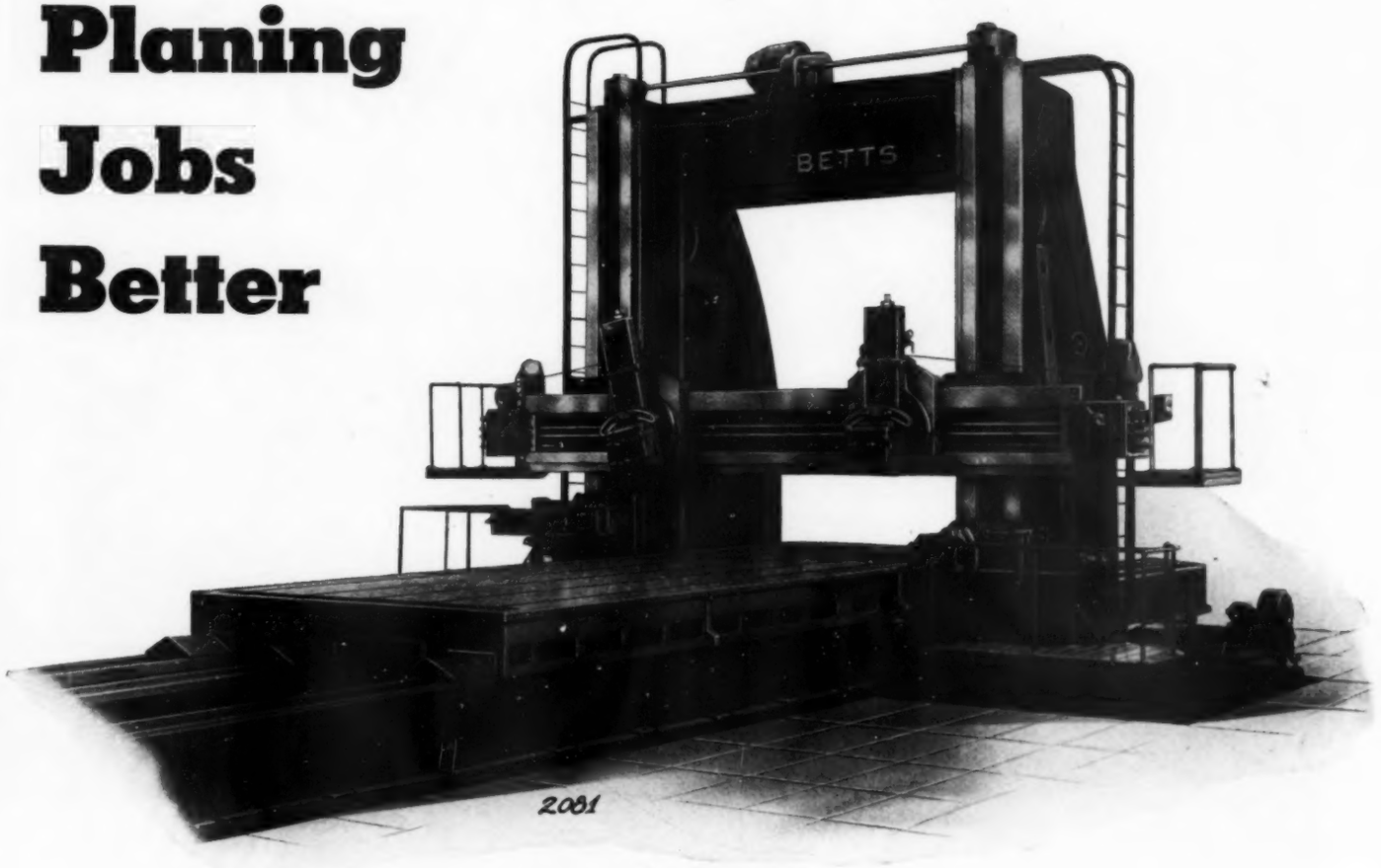
This job is typical of many others which lend themselves to convenient, easy handling on Kingsbury FLEXIMATICS. Ability to perform a wide variety of operations at high production speeds is possible through the FLEXIMATIC method pioneered by Kingsbury. This system provides an arrangement of standard automatic units for various operations and a unique combination of flexible set-up and ready changeover which adapt the machine to specific requirements. Intricate operations can be handled as easily and as fast and accurately as simple ones.

Write today for illustrated Bulletin, showing a number of different set ups.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

Three Ways to do your Big Planing Jobs Better



In these days of continuous operation, hour after hour and day after day, the rugged endurance of Betts Heavy Duty Planers is clearly evidenced.

This large Betts Heavy Duty Planer is built with three bed ways, so that the load is evenly distributed when the wide table is carrying extremely heavy work.

But three ways isn't the only way Betts Planers can help you do your big planing jobs better. Variable Voltage Planer Drive which gives more cutting strokes per minute, provides smooth operation, reverses to a line and offers a wide speed range—automatic electric tool lifters—electric feed are a few of the other features of these machines which make for more effective operation in these critical times.

You, who are engaged in defense work and are enlarging your plant capacity, will find that Consolidated Machine Tools may be able to help you. Ask us more about them.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

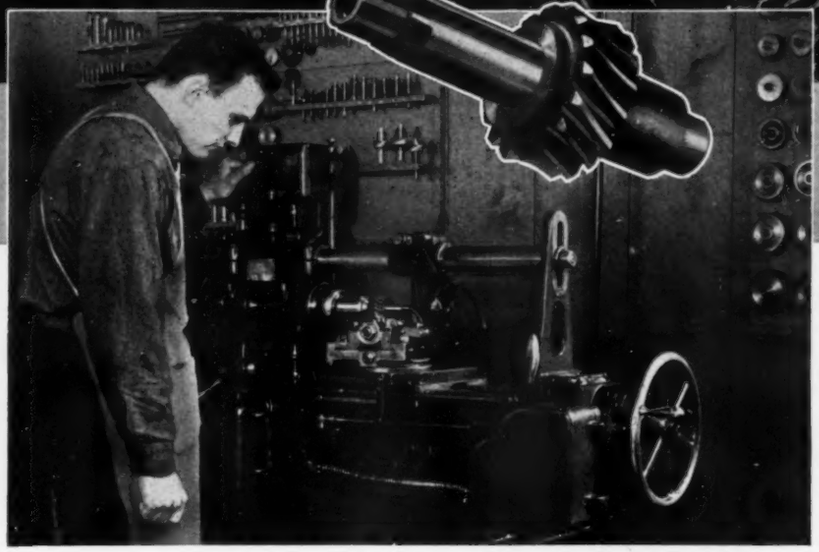
CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

United Speed and Action with Conomatics

Cone AUTOMATIC MACHINE CO., INC.

WINDSOR, VERMONT, U. S. A.

Barber-Colman No. 3 Hobs This Bronze Worm Wheel In 4 Minutes



B-C Hob Produced 7800 Pieces In 65 Sharpenings

A standard Barber-Colman No. 3 Hobbing Machine equipped with a Vertical Feed Attachment hobs Precision Worm Gears in 4 minutes at Skilsaw, Inc., Chicago, Illinois.

The worm gears are made of tough bronze and Barber-Colman Ground Topping Hobs are used. High accuracy and finish are maintained by frequent sharpenings, and total hob life averages 65 sharpenings for a total of 7800 pieces.

Barber-Colman Complete Hobbing Service solves many manufacturing problems of accuracy, cost, or output by applying the versatile hobbing process. Very often this results in freeing other type machines and their skilled operators needed for other essential work.

When you have a production problem on gears, worms or similar forms; consult experienced Barber-Colman Engineers without obligation, and see what B-C Hobbing can do. Just write.

Brief Operation Data

Part — Bronze Worm Wheel mounted on shaft.

Hobbing Machine — Barber-Colman Standard No. 3, with Vertical Feed Attachment.

Operation — Hobbing a bronze worm wheel having 16 teeth, 11 pitch, 1.900″ O.D., 1.592″ pitch dia., 1.774″ throat dia., ¾″ face, 20° pressure angle, and 24° helix angle. Work is fed vertically down to the hob; with hob swivel slide stationary.

Work-Holding — A collet chuck on the spindle and a half-center at the outer end support the worm wheel shaft.

Feed per rev. of work — 0.004″.

Hob Speed — 230 r.p.m.

Accuracy — Tooth form and indexing of finished worm wheel is held within 0.0002″.

Production Time — 4 minutes per piece, floor-to-floor.

Hob — Barber-Colman Single-thread Ground Topping Hob; with 2″ dia. and length, straight bore, 14 gashes.

No. of Settings — 3.

Pieces per Grind — 120.

Total Hob Life — 65 grinds or 7800 pieces.

The well known motor-driven saws and drills made by Skilsaw, Inc., Chicago, Illinois, require exceptionally strong, quiet speed-reduction drives. B-C Hobs and Hobbing Machines provide economical high production of accurate gears for this exacting service.

● Write for Bulletin F-812, fully describing the B-C No. 3 Standard Hobbing Machine which handles work up to 5″ dia. and 12 pitch. Vertical Feed Attachment, used on the above job, is covered separately in Bulletin F-1410, which also describes other special attachments.

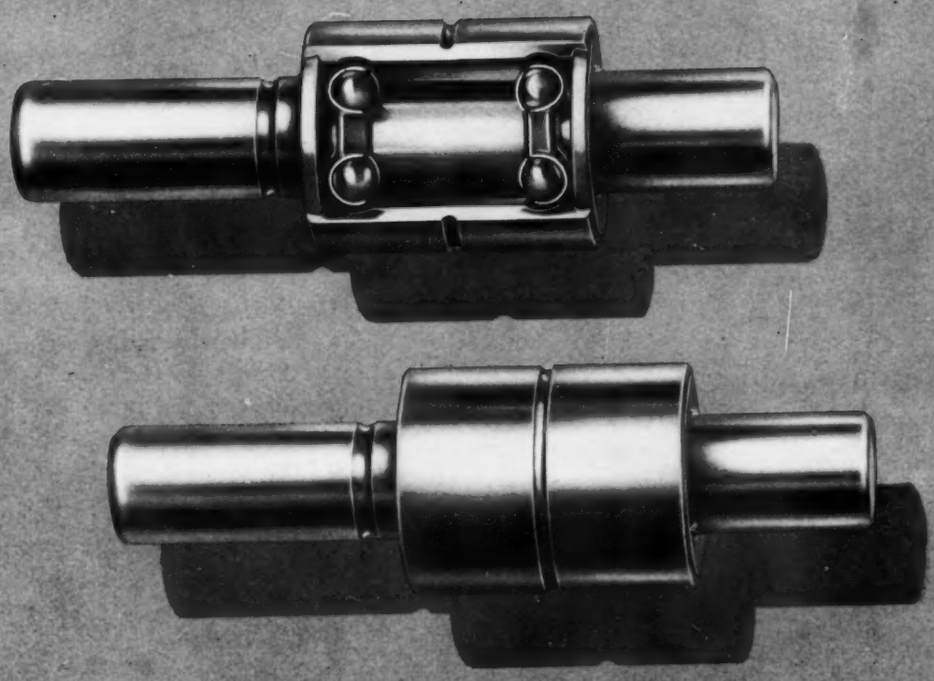
BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

General Offices and Plant 201 Loomis St., Rockford, Illinois, U. S. A.

FEDERAL

for Precision



FEDERAL FAN AND WATER-PUMP BEARING

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

Detroit Office: 2640 Book Tower • Cleveland Office: 402 Swetland Building
Chicago Office: 902 S. Wabash Ave. • Los Angeles Office: 5410 Wilshire Blvd.

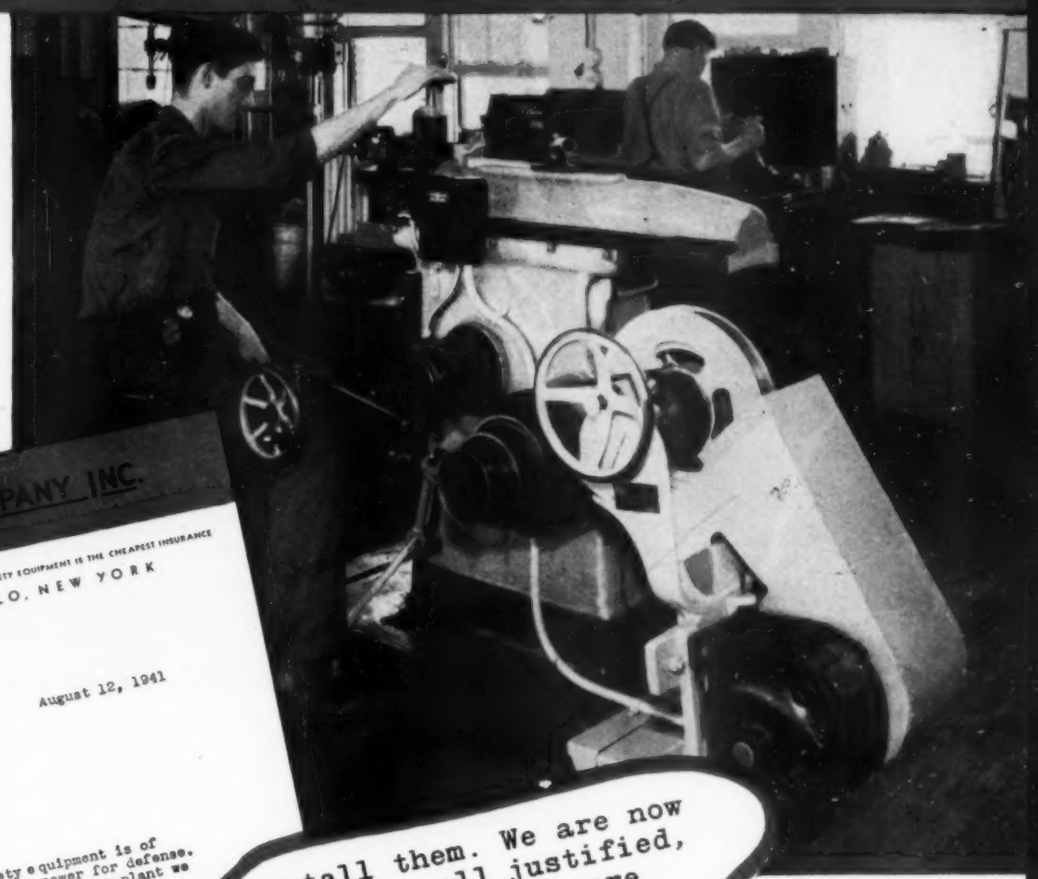
TRADE MARK

"...your new TRI CLAD motor lives up to its name!"

REG. U.S. PAT. OFF.

WRITES RUSSELL S. EGGLESTON, SUPT. AMERICAN ALLSAFE COMPANY, BUFFALO, N. Y.

PROBABLY it's only natural that a manufacturer of safety equipment should put emphasis on protection features of electric motors when he is choosing them for use with new plant equipment. Here is the case of such a manufacturer who not only *sought* those features but *got them*—he selected Tri-Clad motors. Mr. Eggleston reports in his letter below:



AMERICAN ALLSAFE COMPANY INC.

INDUSTRIAL SAFETY AND FIRE PROTECTION EQUIPMENT — Allsafe PRODUCTS — THE BEST SAFETY EQUIPMENT IS THE CHEAPEST INSURANCE

1245 NIAGARA STREET • BUFFALO, NEW YORK

August 12, 1941

Mr. E. O. Jones
General Electric Company
1 W. Genesee Street
Buffalo, New York

Dear Mr. Jones:

Continued production of safety equipment is of paramount importance in conserving man power for defense. Consequently, when we recently moved to our new plant we decided to replace our old motor drives.

happy to inform you that our decision was well justified, for in operation and appearance these motors are more than satisfactory. The protection feature is a big help in our machine shop where there is danger of falling material.

We thought you would be interested in knowing how your new Tri-Clad motor lives up to its name. When we are in the market for more motors, we shall certainly specify Tri-Clad.

Yours very truly,
Russell S. Eggleston
Supt.
AMERICAN ALLSAFE COMPANY

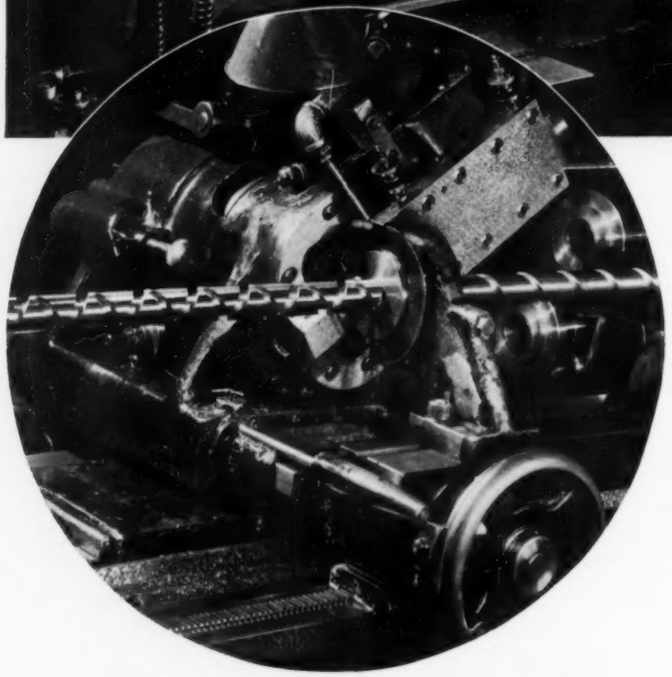
Using new materials in better ways, General Electric builds the Tri-Clad motor to meet the many adverse operating conditions commonly found in industry. They are specifically designed to give *extra protection* against (1) physical damage; (2) electrical breakdown; and (3) operating wear and tear. Ask your G-E representative for full information on types and sizes now available. *General Electric, Schenectady, N. Y.*

BUILT FOR PROTECTION FIRST.....TO LAST

GENERAL ELECTRIC

230-97-8C58

LEES-BRADNER THREAD MILLERS



Close-up illustrates generating RH thread on Rapid Traverse Screw for a 3A-Heavy Duty Warner & Swasey Turret Lathe.

used to produce Rapid Traverse and Lead Screws for

WARNER & SWASEY TURRET LATHES

● The adaptability of this rugged, accurate Thread Miller for producing the long leads required on Warner & Swasey Rapid Traverse Screws results in low cost production of close tolerance threads over entire length of screw. Both left and right hand threads are cut on this Model HT Lees-Bradner Thread Miller. In addition to the machine shown a battery of L-B Thread Millers are engaged in making close tolerance lead screws in another department, another instance where Lees-Bradner equipment is meeting urgent defense requirements.

The LEES-BRADNER Company
CLEVELAND, OHIO, U.S.A.

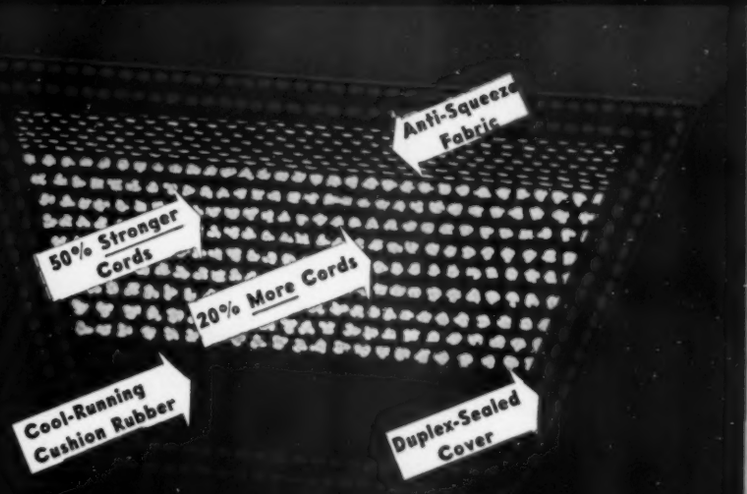
NEWEST V-BELT ON THE MARKET
TEXROPE SUPER-7

1 50% STRONGER CORDS! Sensational new Flexon process makes cords 50% stronger than even those in former great Texrope belts.

2 20% MORE CORDS! Count them! You get 20% more of these tough, extra pulling power cords in every Texrope Super-7.

3 INCREASED LIFE! Cords float on amazing cool-running cushion rubber that absorbs shock . . . actually increases belt life phenomenally.

4 EXTRA PROTECTION! Exclusive duplex-sealed cover protects pulling cords against dirt, grit, moisture, and other adverse elements.



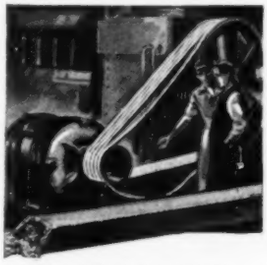
SINCE Allis-Chalmers invented and introduced multiple V-belts sixteen years ago, developments and improvements have been steady... each new type better than the one before... Now, comes the latest and best of them all — the new Allis-Chalmers Texrope* Super-7 V-belt! Without costing any more, it gives you longer life . . . more pulling power . . . greater resistance to stretch. Here's why —

It has 50% stronger cords... 20% more cords . . . and a special new cool-running rubber compound that resists heat . . . absorbs shocks . . . gives years more service. What's more — we wrap the belt in a new "duplex-sealed" two-ply cover that gives extra protection against dirt, moisture, and other adverse elements.

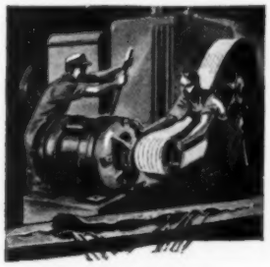
When you order V-belts, get the best . . . *and the best is Texrope Super-7!*

For complete details, call your Texrope dealer or the Allis-Chalmers district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin.

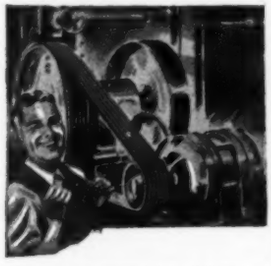
A 1464



LOOK OUT FOR DANGER in belts with stiff, unpliable cords! Such belts *look* strong . . . but actually they buckle over sheaves, build up excessive heat that attacks pulling cords. Result: Belt failure far sooner than you expect it.



WARNING SIGN! Sagging, slipping belts mean too much stretch not backed up by balanced cord strength. Motor must be pulled back often to take up slack. Result: When stretch limit is reached belt breaks under tension.

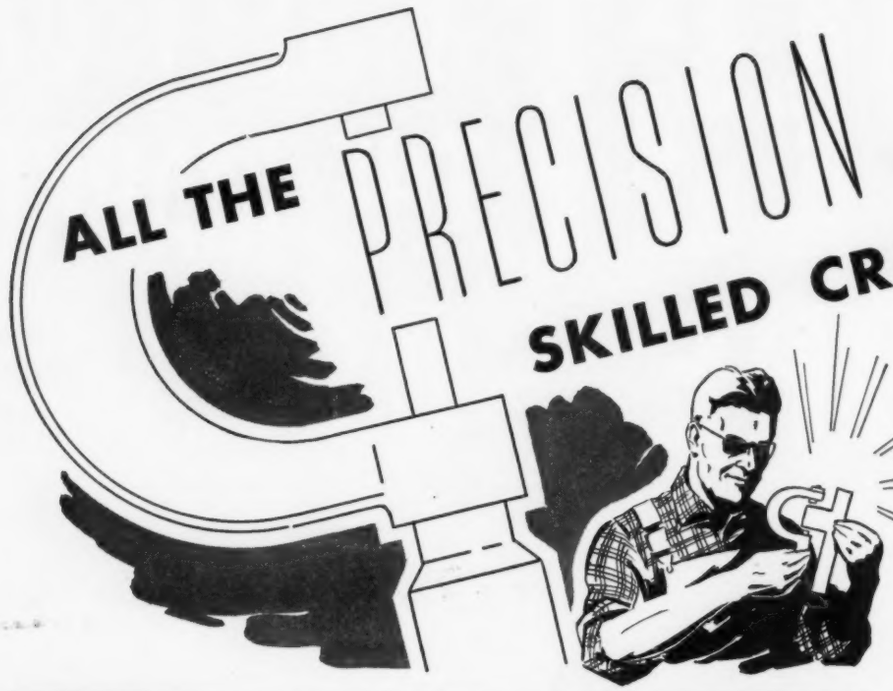


SUPER-7 TEXROPE BELTS are made by amazing Flexon process that *combines* flexibility with low stretch . . . great strength. Cords float on cool-running, shock absorbing cushion rubber. Result: *true* strength . . . *true* pulling power . . . *true* endurance.

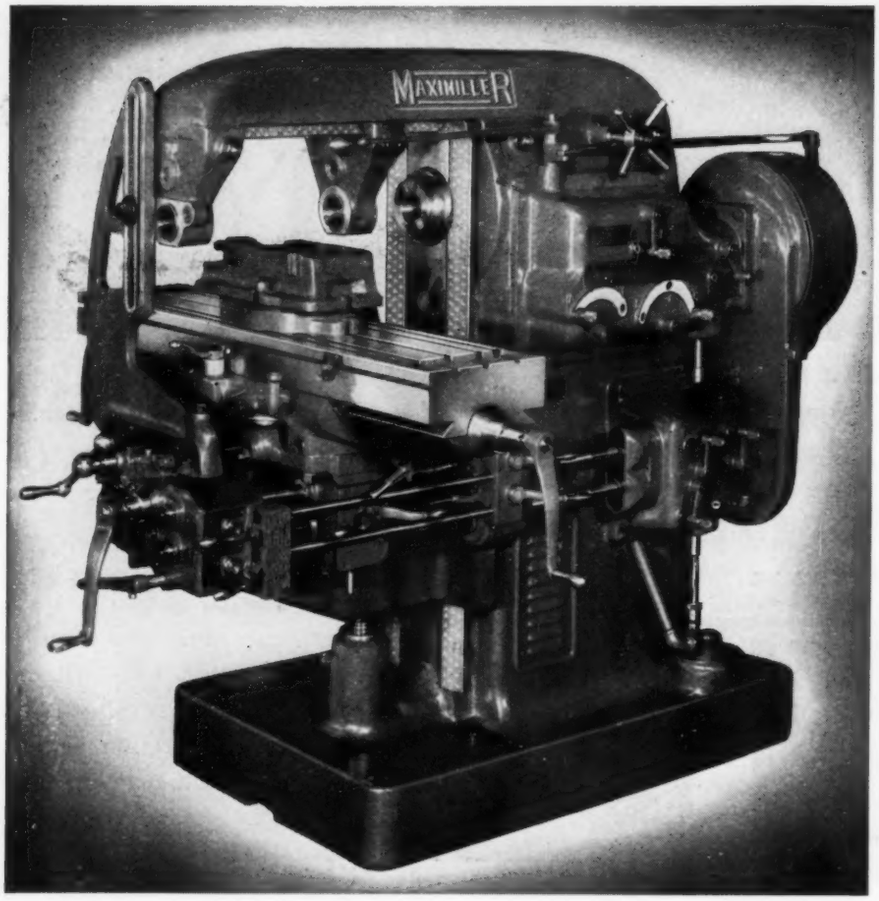
*Trade mark registered U. S. Patent Office. Texrope Super-7 Belts are the result of the co-operative research and design genius of *two* great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers.

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

ALL THE PRECISION OF A SKILLED CRAFTSMAN PLUS . . .



UNUSUAL FLEXIBILITY AND POWER



● The Kempsmith Maximiller is ruggedly constructed and has extra power to give it the unvarying ability to handle heavy, continuous cuts on long production runs with unusual accuracy. Available in Horizontal and Vertical types... the Horizontal in both Plain and Universal models.

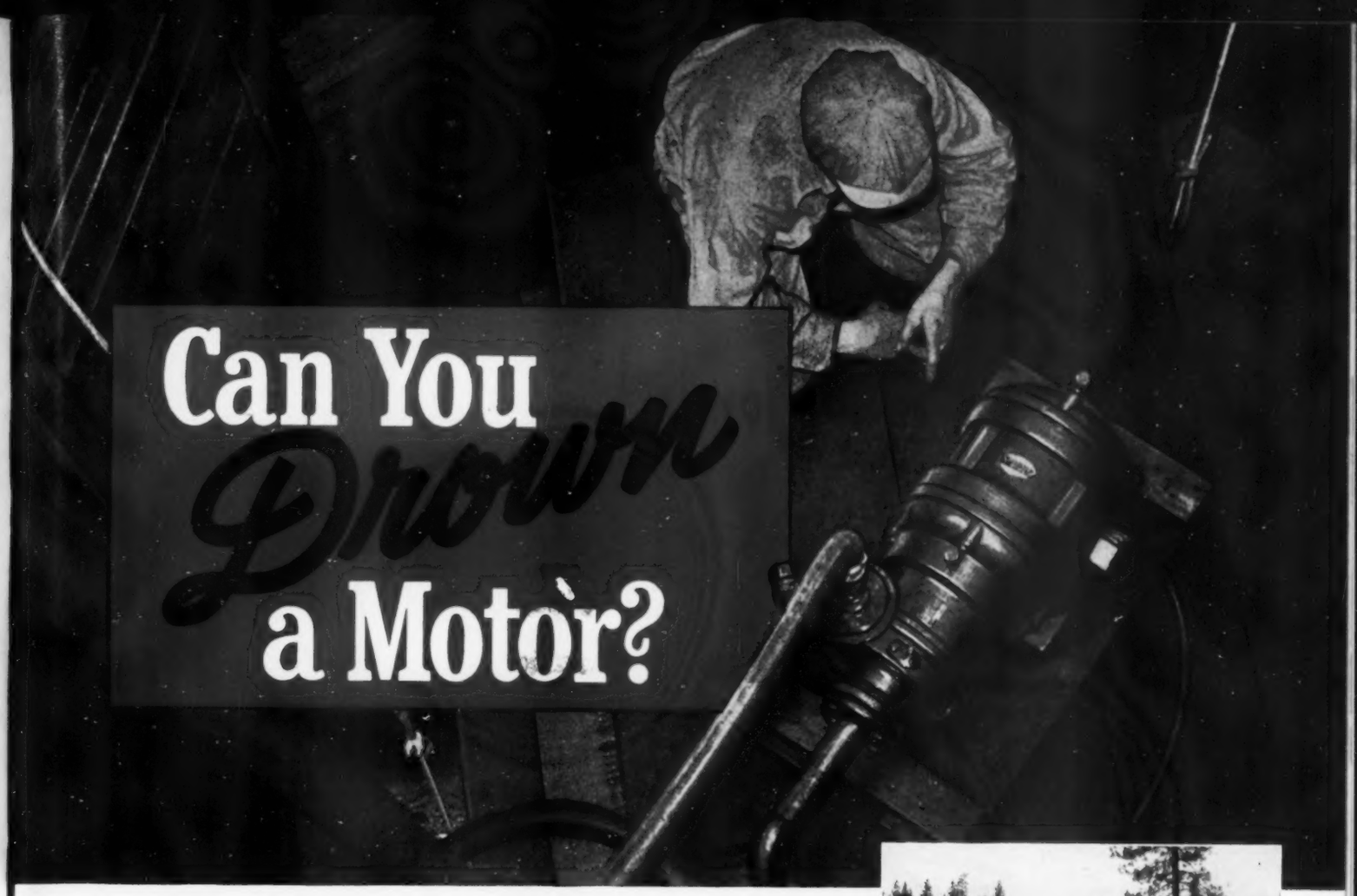
The Kempsmith Type G geared-head milling machine is recommended for Tool Room work requiring precision and accuracy, and also for lighter production needs.

Dividing Heads • Heavy Duty Vertical Attachments • High Speed Universal Attachments • Slotting Attachments • Vises • Arbors • Rotary Tables

Catalogues and complete information sent on request.

KEMPSMITH
KEMPSMITH MACHINE CO.

MAXIMILLER
MILWAUKEE, WISCONSIN



Can You *Drown* a Motor?

HOW MUCH punishment should a motor be able to take? This is an important question to motor buyers . . . for you never know when you'll need *extra* performance . . .

Take the case of the Western Molybdenum Corporation mine at Chewelah, Washington. They bought an Allis-Chalmers Pump powered by an Allis-Chalmers 10-hp Lo-Maintenance Motor.

Motor and pump were placed on a raft in a well. But due to an obstruction in the shaft, the floats stuck, and the motor operated under water for four days before it was noticed.

Then, to top it off—because the motor switch was still on when the water was lowered, the current ran through the exposed motor for 15 minutes more!

But—in spite of this terrific punishment, all that was needed was 24 hours of oven drying. Then the motor was hooked up... the switch turned on . . . and it purred into instant action. There was no additional repair cost . . . and today this motor is still giving 100% service!

For Lower Maintenance!

An exceptional case, certainly. In fact, we don't claim that Lo-Maintenance Motors are built for under-water operation. Nor will you probably ever demand this type of service. But it is your right to demand motors that cost a minimum of maintenance under *all normal operating conditions!*

That's the kind of low-cost, dependable performance Allis-Chalmers Lo-Maintenance Motors give you.

RUNNING FOUR DAYS UNDER water didn't stop a 10-hp Lo-Maintenance Motor located in a well pit of the Chewelah, Wash., mine of the Western Molybdenum Corporation.

It's performance based on full-measure, no-stint construction, distortionless stator, indestructible rotor, high carbon steel frame, and other extra-value engineering features.

Get the facts from the trained engineer in the district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin.

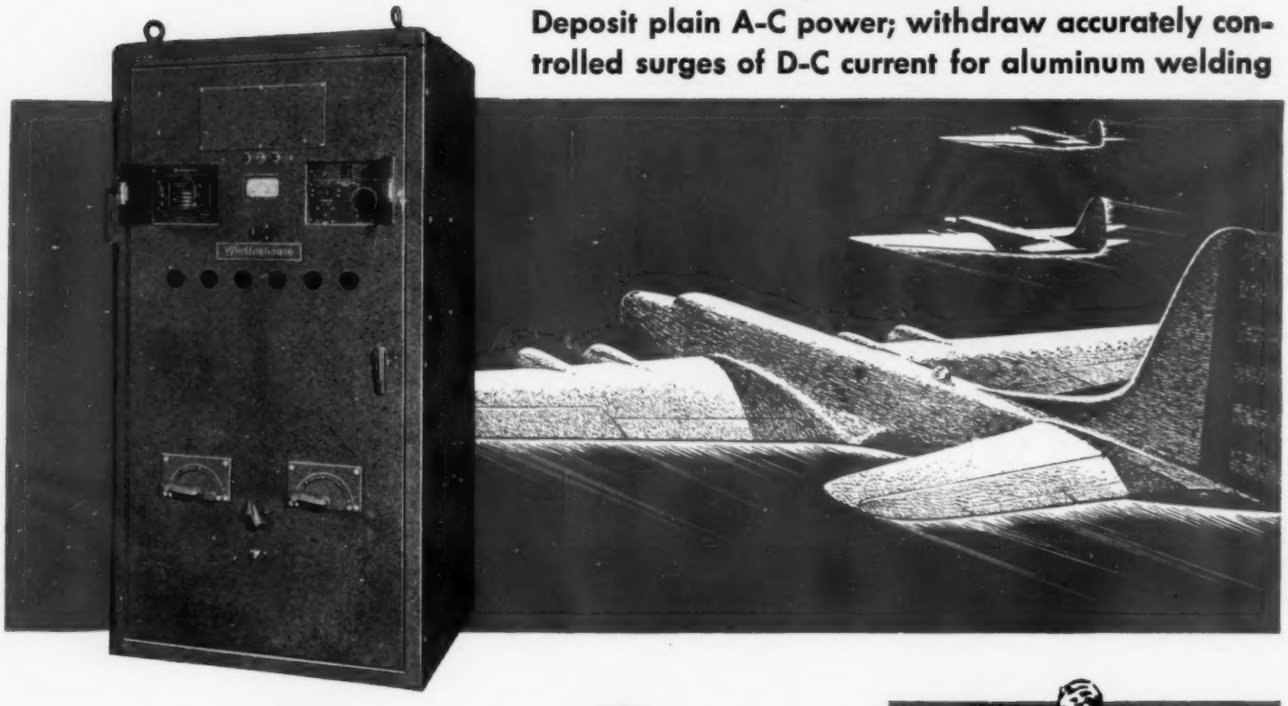
A1392

ALLIS-CHALMERS LO-MAINTENANCE MOTORS

A COMPLETE LINE FOR EVERY PURPOSE...ONE-HALF HORSEPOWER AND UP

it's a "Power Bank"—

Deposit plain A-C power; withdraw accurately controlled surges of D-C current for aluminum welding



Stronger Planes

DUE TO UNIFORMLY STRONG WELDS—THANKS TO THESE ACCURATELY CONTROLLED SURGES OF D-C CURRENT

There's a new and better way to weld aluminum and other similar metals with a narrow plastic range. It doesn't require costly auxiliary transformer or power equipment; doesn't impose huge peak demands on power supply —it *does* improve weld quality on aluminum alloys. Here's how it works:

CONDENS-O-WELD is a complete, compact, enclosed rectifier-capacitor-timer unit for use with resistance welders of the electrostatic stored energy type. Energy is drawn from a 3-phase a-c power line, rectified, stored electrostatically and released in accurately controlled discharges into the welding machine. Voltage, current and wave form factors are preset or adjusted at the cabinet control board. Before you buy new welding equipment, before you spend time and money revamping a power system overtaxed by resistance welding demands—write for detailed data on Condens-O-Weld. WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., Dept. 7-N.

2 ways

CONDENS-O-WELD HELPS KEEP PLANE PLANTS AT PEAK EFFICIENCY

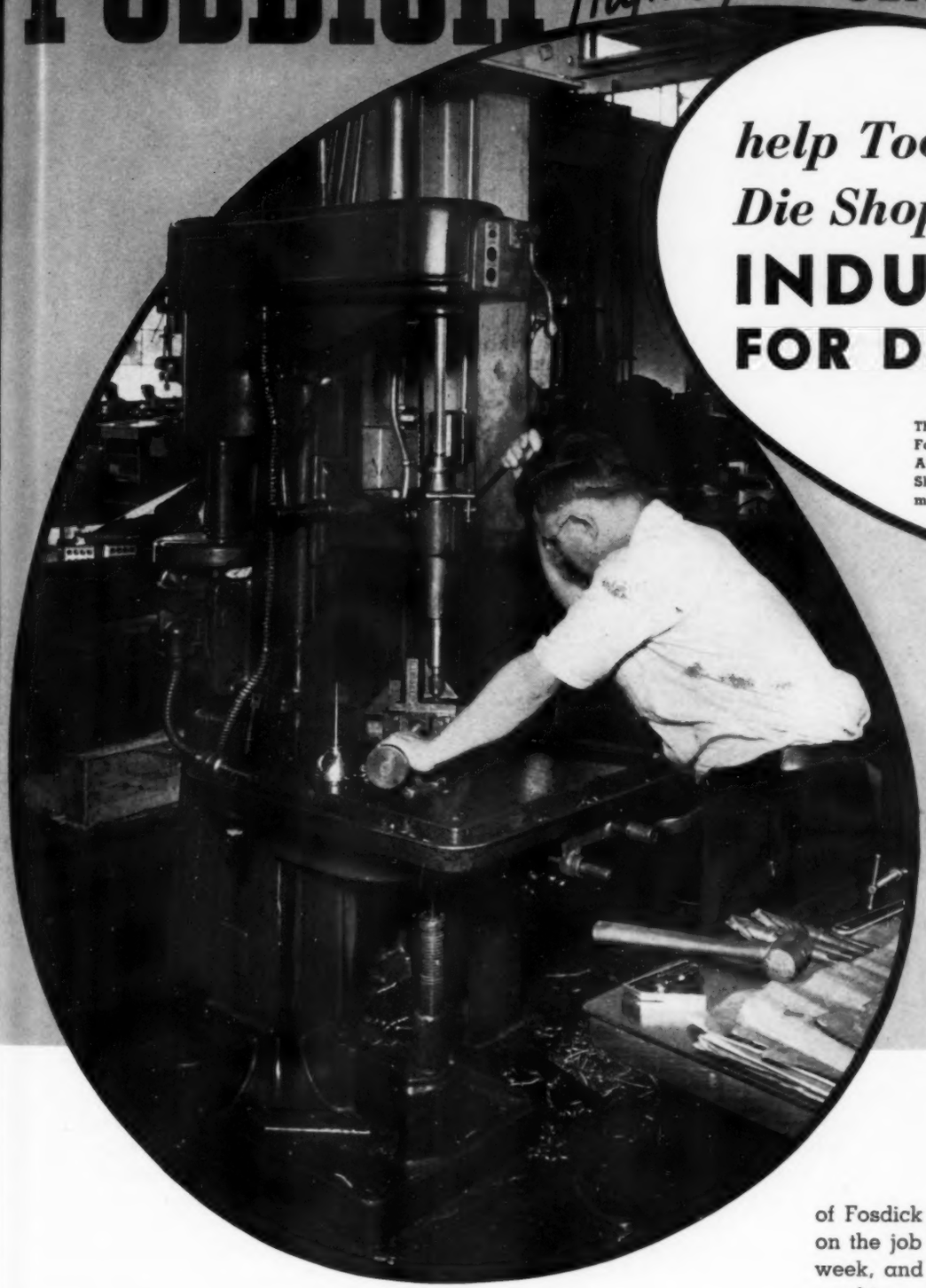
1. **BALANCED 3-PHASE LOAD**
Power requirements spread over three phases, not concentrated in instantaneous surge demand on a single phase.

2. **MINIMUM Kv-a DEMAND**
Fast charging rate with efficient electrostatic storage of power cuts peak kv-a demand to a minimum.

J-21174

Westinghouse
CONDENS-O-WELD

FOSDICK *High Speed* SENSITIVE DRILLS



help Tool and Die Shops "tool-up" INDUSTRY FOR DEFENSE

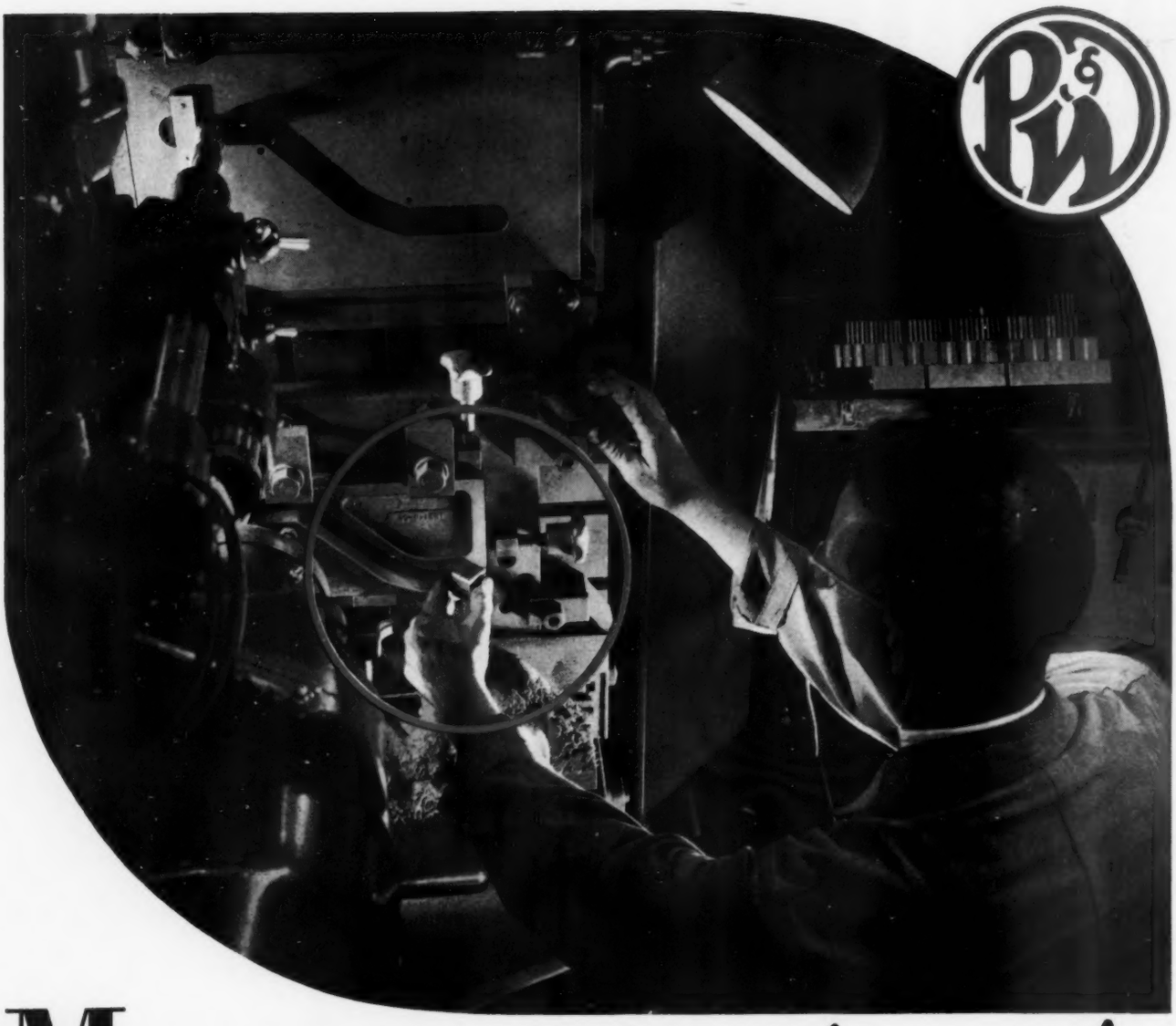
The accompanying illustration shows a Fosdick High Speed Drill with Tapping Attachment at the Faigle Tool & Die Shop in Detroit. This is only one of many jobs handled by this machine.

● All industry is "burning the midnight oil" on 24-hour schedules in an earnest endeavor to keep abreast of the urgent demands for defense materials. Tool and Die Shops are particularly hard pressed to make deliveries on tools, dies, jigs and fixtures for munition and industrial plants.

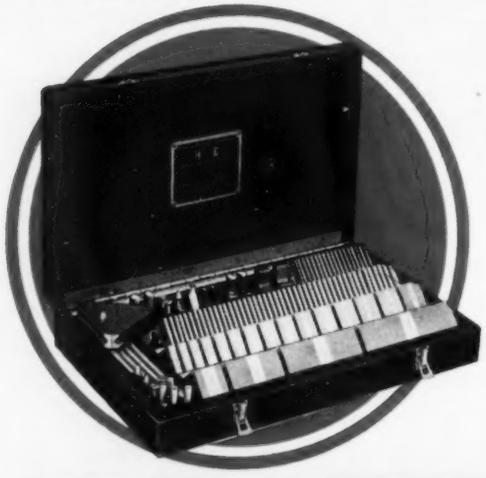
In the Tool and Die Shops alone there are hundreds of Fosdick High Speed Sensitive Drills on the job 24 hours a day, week after week, and month after month. These machines are drilling, reaming, boring small holes in all kinds of work, quickly—accurately—economically.

No matter what your work is, if it requires drilling, boring, tapping and similar operations on work requiring the use of sensitive drills — there's a Fosdick for that job. Write for complete details. Ask for High Speed Drill Bulletin—H. S. A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO



MILLIONTHS *at work!*

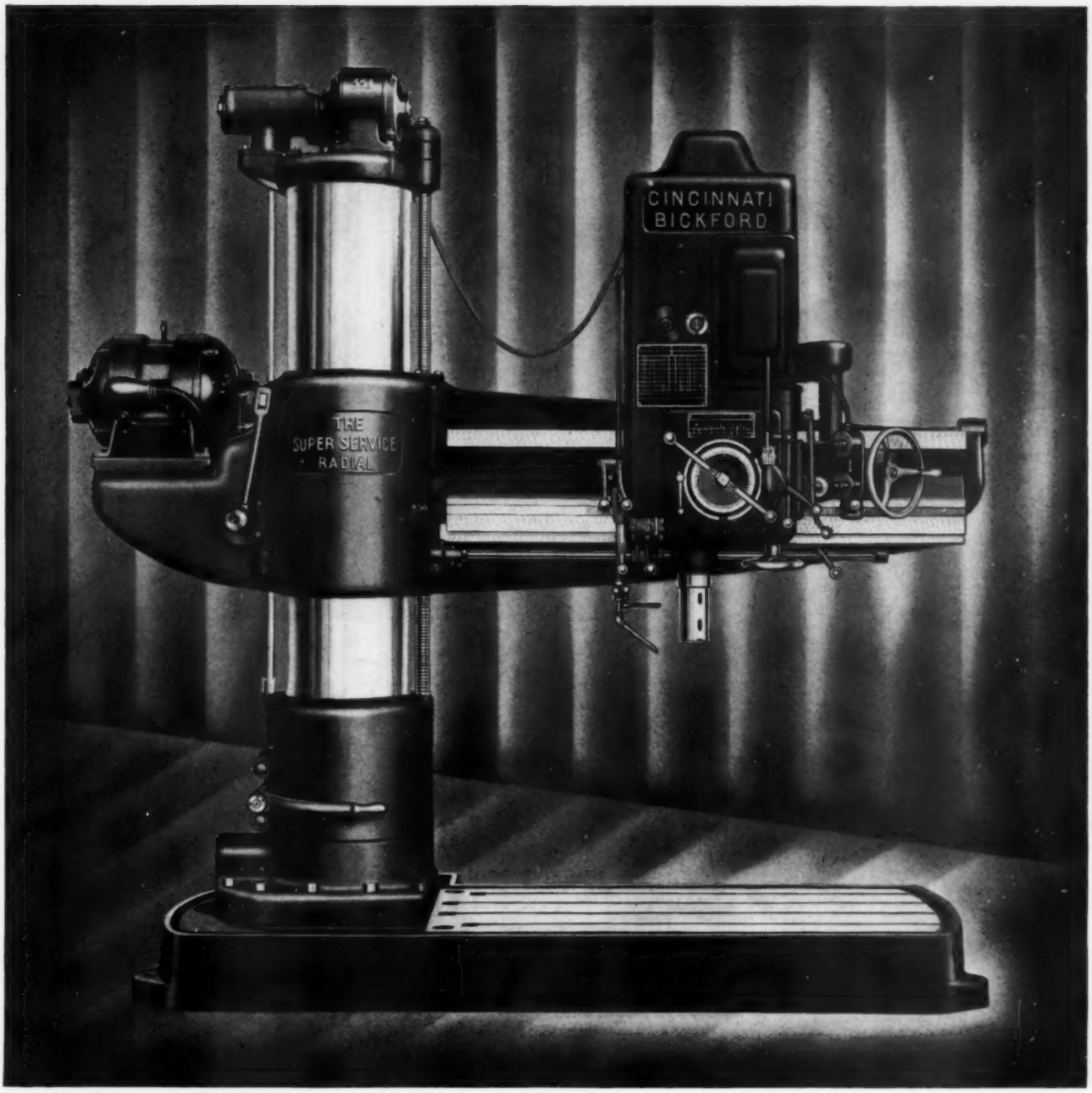


Here is a Keller Machine doing a special job — milling an accurate cam path. The slot width is important and you can see for yourself how this operator makes sure of it. That little stack of Hoke Precision Gage Blocks tells the story.

You can make up any dimension you want with P&W Precision Gage Blocks. Each is accurate within a few millionths of an inch so that you can wring them together in stacks as you wish, and the combined errors of the several blocks are still negligible. They are the precise standards for setting other gages or for checking actual jobs.

P&W Precision Gage Blocks are sold either singly or in sets of various convenient sizes. The 85E set is shown at the left. For complete information write to Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Conn.

PRATT & WHITNEY



LARGE jobs •••— SMALL machines •••— BIG time savers •••— LITTLE overhead

In other words, drilling efficiency is the result of the Cincinnati Bickford Tool Company's exclusive specialization, for over a half a century, in Radials and Uprights.

The Super Service Radials are available in sizes from 3 to 8 foot arms and the Super Service Uprights in 21″, 24″ and 28″ sizes.

For further information on standard or special metal drilling machinery adaptable to your requirements write us today.

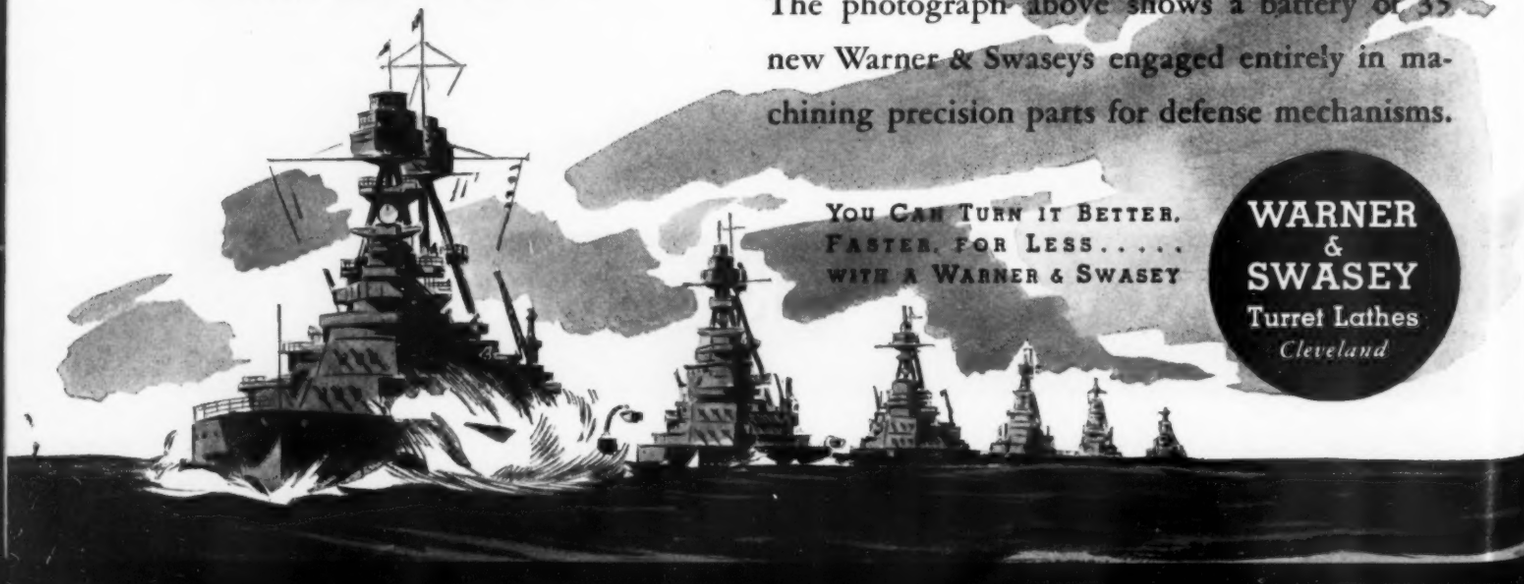
THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

● Congratulations to the workers of Bausch & Lomb, from the 3,600 employees of Warner & Swasey, on meriting the honor of being one of the first groups of defense workers to receive the Navy E Pennant for outstanding performance. It is good to know that the turret lathes and metal turning tools we build are being used so capably in producing the things so essential to Army and Navy.

The HIGHEST NAVY AWARD *for* EXCELLENCE *Goes to BAUSCH & LOMB*

● The Bausch & Lomb Optical Company, world famous for the excellence of their products, have been expanding production facilities since 1939 to meet the demand for optical fire control instruments, range finders, height finders, gun sights, etc. Ninety percent of the turret lathes in the Bausch & Lomb plant are Warner & Swaseys. The photograph above shows a battery of 35 new Warner & Swaseys engaged entirely in machining precision parts for defense mechanisms.



YOU CAN TURN IT BETTER, FASTER, FOR LESS.....
WITH A WARNER & SWASEY

WARNER & SWASEY
Turret Lathes
Cleveland

WHAT'S IN THIS ISSUE

H. J. WILLS

MAINTAIN BALANCE

You can't expect quality finishes or precision work from grinding wheels that are out of balance. Yet proper balancing of wheels is often neglected, even after time and money are spent in selecting the proper wheels for the proper jobs. Out-of-balance can be avoided by exercising a few precautions and using standard equipment available for that purpose. H. J. Wills, Carborundum Company engineer, gives important details on this subject on page 1309.

FIXTURE LOCKS

Multiple-station jigs and fixtures are essential for volume production of machined parts. Operating time is reduced when loading is done at one station while at another machining is underway. This requires accuracy in locating parts in the jigs and fixtures—precise index-mechanism locks serve this purpose. John G. Jergens, Cleveland Pneumatic Tool Company, is an expert on the subject. On page 1312 he shows typical locking devices suitable to cover a wide variety of applications.

FAST TRAINING

The value of vocational schools as an aid in training unskilled men for jobs in defense plants cannot be contradicted after reading the article "Schools Pre-Train G.M. Workers," on page 1335. G.M.'s Saginaw Steering Gear Division found it impossible to train in its shop the hundreds of men needed for the immediate production of machine guns. Fortunately, vocational training has been for years a strong feature of the Saginaw school system. This has paid dividends. Young men and old, representing over 50 percent of workers in the Saginaw plant, were pre-trained before entering the shops. But training doesn't stop there. It continues in the plant classroom and during working hours. An accurate check is kept on each man in the plant, which has helped no little in selecting set-up men and foremen.

FLAME-HARDENING ROUND PARTS

Both circular and spiral band progressive methods are used when flame hardening shafts, rolls, cylinders, sleeves and other cylindrical surfaces. Proper technique and equipment for such work are treated on page 1317 in the current installment of "Oxyacetylene Flame Hardening," by J. G. Magrath, Air Reduction Company.

GRIND TOOLS PROPERLY

Successfully prolonged cutting tool life begins with proper selection and application of the tool. But it is proper sharpening that reduces waste to a minimum — improper sharpening limits speeds and feeds and, by reducing the number of cuts per grind, shortens tool life. Grinding practices that will go a long ways to eliminate such waste, and which are applicable in any shop, will be found on page 1314. The author is Roy T. Wise, deputy machine tool controller, Department of Munitions and Supplies, Ottawa, Canada. He has put the practices to work in Canadian industrial plants where tool breakage has been reduced materially.

A REAL FORGING

The 222-lb. forgings for 40-mm. tank gun mounts are completed in a single heat under a 20,000-lb. Chambersburg hammer. A two-cavity die is used. Considerable flow of metal is involved in making the forging, which has three heavy portions separated by long light sections. Herbert Chase contributed this interesting story. It will be found on page 1334.

MORE ON ELECTRICAL STANDARDS

The second and third Reference Book Sheets on standards for the electrification of machine tools will be found on pages 1339 and 1341. The standards, prepared by the National Machine Tool Builders' Association, give data which simplifies the preparation of specifications of electrical equipment for machine tools. They should find general acceptance because they will eliminate much of the delay, expense and confusion which results when the builders attempt to follow special instructions and specifications in orders submitted by purchasers.

JOHN G. JERGENS

FUZES FOR AERIAL BOMBS

The successful and fast production of war material often requires only the retooling of standard machines in American plants. Take the Westinghouse Electric & Mfg. Company's plant at East Springfield, Mass., for example. In peace-time, automatic lathes make parts for refrigerators, air-conditioners, electric fans and vacuum cleaners. Today they are making fuzes for light fragmentation aerial bombs. Other plants with experience in making small precision parts for commercial equipment are or soon will be working day and night on material for our fighting forces. Details on tool set-ups for automatic lathes, such as given in the Armament Section, page 1323, show how the change-over to the production of war equipment can readily be made.

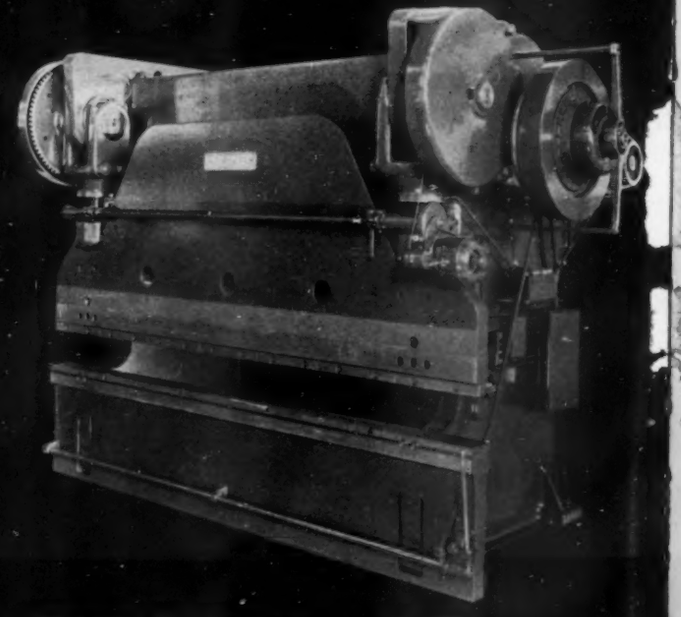
COMING

It's rather difficult at times to select the proper electrode for a given welding job. Many factors are involved: the machine used, physical properties of the rod, type of weld, welding method, the base metal, and whether hand welding, with or without fixtures, or machine welding is to be used. Data on this problem will appear in an early issue.

This Machine Works All the Time

Straightening billets is one of a great variety of important odd jobs done on this Cincinnati Press Brake in between high production runs of punching, forming, and notching operations.

Properly applied, a press brake has no "spare time." Write for recommendations on your range of work. Standard capacities from 75 through 1,000 tons.



Pioneers of the Steel Press Brake

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CINCINNATI, OHIO.

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Balanced Wheels Give Best Work

BY H. J. WILLS, ENGINEER, THE CARBORUNDUM COMPANY

Out-of-balance is one of the most formidable enemies of good finish in grinding. Here's how it can be detected and corrected

A COMMON MISTAKE is to give careful attention to the selection of exactly the right grinding wheel for a job but to slight the all-important task of keeping the grinding wheel in balance. Yet it is impossible to do precision grinding or to generate ultra-finish surfaces with an out-of-balance wheel.

An out-of-balance wheel hammers the work. A sure sign of it is the appearance of long, regularly spaced chatter marks which form a checkerboard pattern. Isolated deep marks may be caused by incorrect dressing, coarse grits or foreign matter in the face of the wheel or a disintegrating bond which permits abrasive particles to be pulled out. But the most common causes is probably chatter caused by poor wheel balance.

Rebalance After Mounting

When first mounting a new wheel, it is advisable to balance the wheel both before and after truing. A new wheel is likely to be reasonably concentric with the arbor hole but may not be concentric when mounted on the arbor, ready for use. In that event, the first balancing is done when the wheel is out-of-round. When it is trued on the grinding machine, the high spots are leveled off and the wheel becomes out-of-balance. It must then be rebalanced.

If the truing is done wet, the wheel absorbs coolant. In a few moments of standing on the machine or the balancing ways, the coolant will settle at the bottom of the wheel, causing false out-of-balance. It is necessary to allow the wheel to rotate for several moments

Fig. 1—A simple and direct method of balancing is to support the wheel arbor on two pairs of overlapping wheels

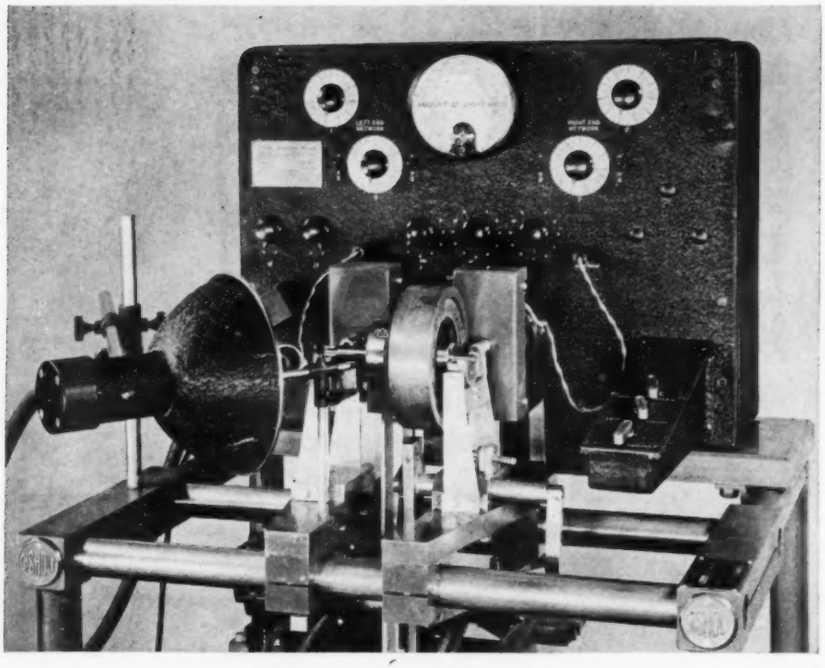


Fig. 2—Vibration caused by unbalance in the revolving wheel is recorded electrically by the Gisholt balancer

until all of the coolant has been thrown off. For ultra-finish grinding, the safe plan is to allow the wheel to become absolutely dry before balancing it for the second time.

Experience may show that either the first or second balancing may be omitted, but it is better to play safe and balance both before and after truing. The greater the centrifugal forces set up in the grinding operation, the greater the need for accurate balancing. So the higher the peripheral speed and the greater the diameter of the wheel, the more careful the balancing required.

When using large wheels it is advisable to rebalance them at intervals as the diameter of the wheel diminishes from wear. It is impossible to produce wheels which have exactly the same density throughout their structure. Thus a 36x4-in. wheel is likely to become out-of-balance when the diameter has worn down to say 30 in.

Equipment Detects Out-of-Balance

Several types of equipment for determining the location and amount of the out-of-balance are available. A common type provides parallel ways to support the wheel mounted on an arbor and balancing spindle. The heavy part of the wheel seeks to reach the lowest point, and after some oscillation, the wheel comes to rest when that condition is reached.

Since the wheel must be free to move easily in response to even a slight out-of-balance, it is essential that the ways be true. There must be no dents or other defects to prevent the arbor from rolling, and the ways must be parallel. Ways may easily be dented when tapping the balancing weights into adjustment so the tapping should be done from the bottom, never the top.

The plane of the wheel must be parallel to the ways, that is to say, the spindle must be at exactly right angles to them. If not, the wheel will either run into the ways, preventing free movement, or the balancing spindle will slip on the ways instead of rolling.

Unless the ways are absolutely level, the wheel will roll from other causes than out-of-balance. Also, unless the wheel periphery is absolutely clean, the foreign matter may make the wheel roll on the ways, thus indicating an out-of-balance which does not actually exist.

Another balancing device uses the same principle, but the wheel, its arbor and spindle rest in the V's formed by two pairs of overlapping wheels as shown in Fig. 1. It is not necessary for this device to be exactly level, although it is essential that the wheel and equipment be kept clean.

Several more elaborate devices are available for locating and measuring out-of-balance.

The Gisholt balancer, Fig. 2, may be used for either static or dynamic balance. The unbalance is indicated electrically; the position of the unbalance and the amount of weight needed for correction are both shown.

A static balancing machine made by the Taylor Manufacturing Corporation locates the heavy spot by means of a sensitive spirit level. The amount of unbalance can be determined by either an automatic weighing dial or a hand operated beam. By the use of this instrument accuracy can be corrected to 0.01 in.-oz.

Another balancer suitable for grinding wheels is made by the Tinius Olsen Machine Company. The wheel is mounted on an adapter fitted to a horizontal spindle of the machine. The position the wheel takes gives the angularity of unbalance while a dial indicator used in conjunction with a weighing device gives the amount.

Portable Device Available

A portable device made by the Electrocon Corporation, Fig. 3, makes it unnecessary to dismount the wheel from the grinding machine when balancing. It uses a vibrometer and a stroboscopic light to detect out-of-balance conditions.

No matter what kind of device is used to locate the out-of-balance and determine its amount, the correction is made in the same way, by shifting weights on the wheel arbor. Some arbors have two weights, others four.

The location of the out-of-balance is determined with the weights removed from the mounting. The heavy point is marked as in Fig. 4. To check, turn the wheel through 90 deg. first to one side and then to the other. If all trials give the same heavy point, the probability is that the point has been accurately found.

If the wheel is equipped with two balancing weights, the next step is to

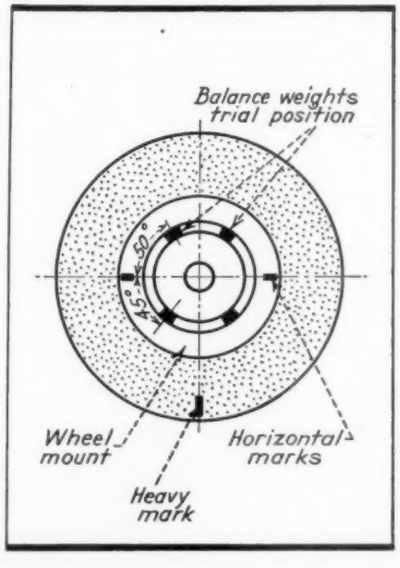


Fig. 4—Out-of-balance is corrected by shifting weights on the wheel arbor to offset the "heavy" portion of the wheel

draw a horizontal line on the wheel through the axis of the wheel, while the heavy point is at the bottom.

The two weights are inserted just above the horizontal line and equidistant from the center of the wheel. If the heavy point is still where it was, move the weights higher in the circular groove—which brings them closer together. If the heavy point has changed to the other side of the wheel, lower the weights, which will separate them somewhat.

Do Not Chip Wheel

The balancing position will usually be found when the weights are somewhere between the horizontal line and the top of the groove. If the wheel does not balance when the weights touch each other at the top of the groove, the wheel is too much out-of-balance to be corrected with two weights. Three or four weights will have to be used. Do not try to correct the balance by chipping out the wheel and adding lead. This is likely to damage the wheel.

When the arbor is equipped with four balancing weights, the heavy point is located in the same way. Insert the weights 90 deg. apart, as shown in Fig. 5. First move the top weights closer together and then check the balance. If the heavy spot is still where it was, separate the bottom weights.

Then turn the wheel through 90 deg. If the heavy point is now 90 deg. away from where it was, draw a new horizontal line for reference, and go through the same procedure, until accurate balance is achieved.

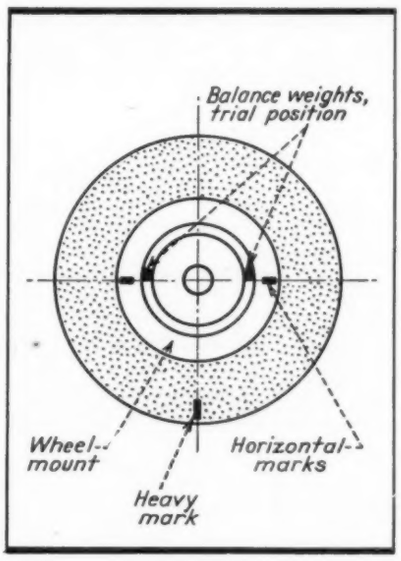


Fig. 5—When four balancing weights are used, the upper two are brought together as the lower two are separated or vice versa

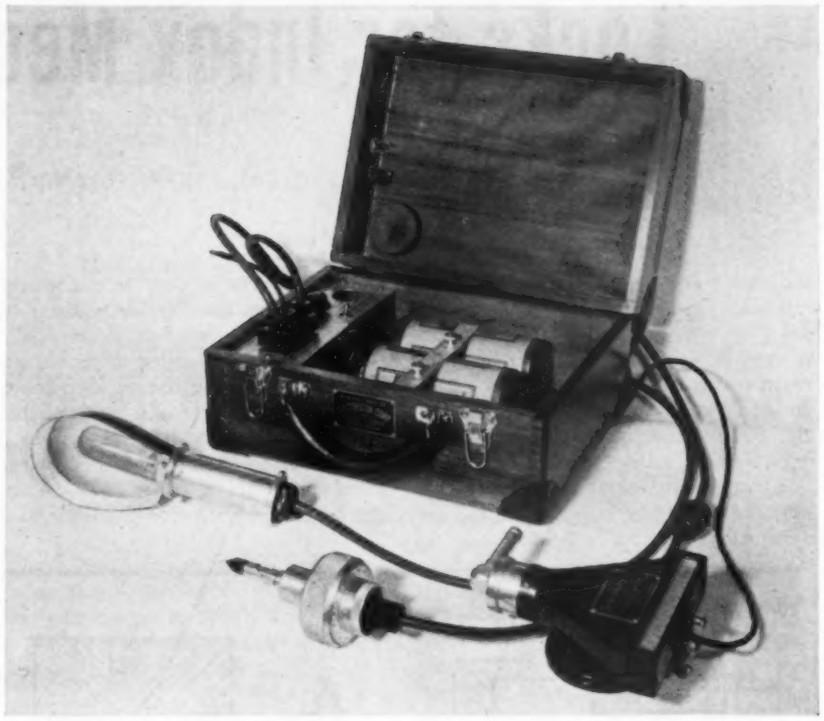


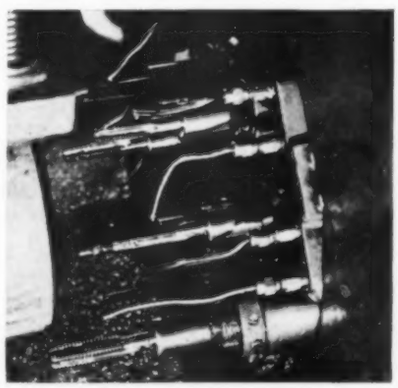
Fig. 3—The "Davey" portable balancing unit has the advantage of portability. It analyzes balance through vibration and stroboscopic examination

Metered Lubrication Improves Automatic Tapping

THE PROBLEM of providing proper tapping and drilling lubrication on multiple-station machines performing both these operations has been satisfactorily solved by application of the Bijur automatic lubrication system. By this means enough oil is supplied to the taps to insure maximum life and good work finish, while the soda water or other drill coolant is kept uncontaminated by the oil.

The lubricator is completely automatic in operation. When the tapping head advances, the lubricator plunger is operated by a dog track and delivers oil to the taps. On the return stroke, the plunger is again operated and the oil ejected washes the chips off the taps. Since the amount of lubricant supplied to each tap is accurately metered, only enough oil is used to achieve best results. In practice this is such a small quantity that it all remains in the tapped hole, thus preventing contamination of the coolant by excess oil. Metering also reduces to a minimum the amount of oil carried away on the work.

Savings possible from the use of this device are illustrated by the experience of a prominent automobile company. In one application the machine drills, faces and taps the end of a shaft of 320–340 Brinell hardness. Before using the equipment, the life of taps was from 75 to 100 holes. With the lubricator the taps are run for 340 pieces, sharpened, and then run for another 350–400 pieces. Some ten dollars a day is saved on taps alone, scrap loss is reduced and finish much improved. Oil consumption is around one quart per tap per day.



Small tubes deliver a metered quantity of oil to each tap

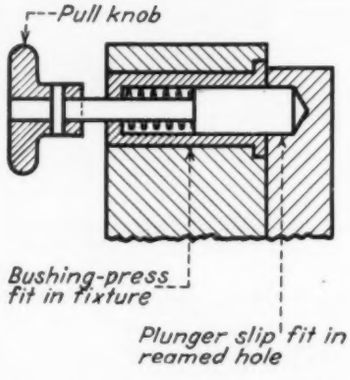
Locks for Index Mechanisms

BY JOHN J. JERGENS, CLEVELAND PNEUMATIC TOOL COMPANY

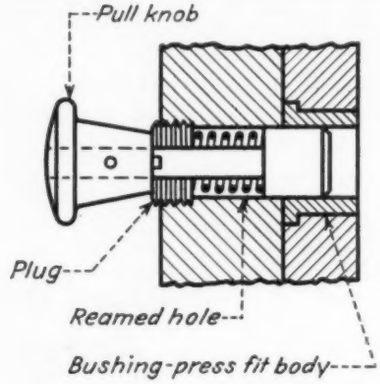
MULTIPLE-STATION JIGS and fixtures are being applied more frequently today than ever before by tool engineers where lot sizes justify, particularly when the machine on which they are to be used has an automatic operation cycle. Such fixtures permit loading at an open station while machining operations are being performed at one or more of the other stations. Thus, the machine is kept in operation a greater portion of the time and machine time per piece is reduced proportionately.

In some cases, indexing is accomplished by rotating the jig or fixture; in other cases, indexing is accomplished by moving the jig or fixture in a straight line successively under two or more spindles. In either case, it is essential that means for accurate location be provided at each work station.

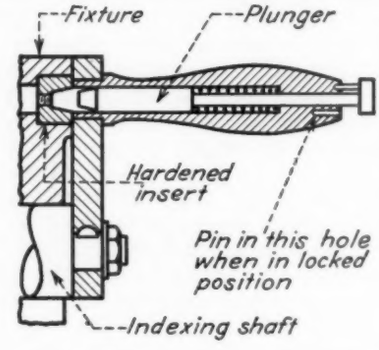
The following examples show a number of means by which accurate location can be accomplished. In all of these examples, the plunger and its bushings are hardened to reduce wear to a minimum. While the plunger should slide easily into the indexing hole, the fit should be snug if accuracy is desired.



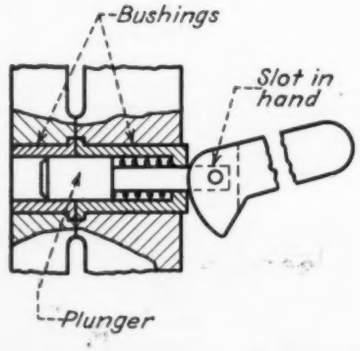
Pull-type index lock pins are the simplest means of locating an indexing fixture; hardened bushings are usually preferred to reamed holes



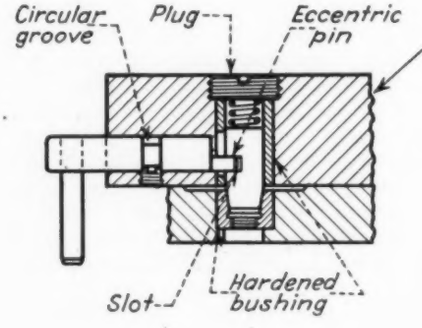
This modification of the pull-type index lock pin may be removed without disassembling other elements



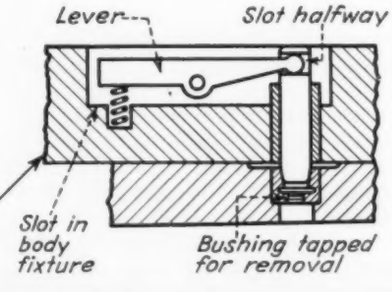
The index lock employed in this mechanism is fitted into the handle controlling the indexing shaft



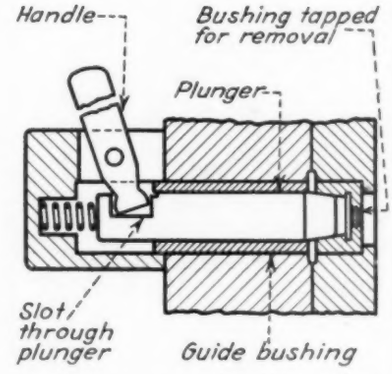
In this arrangement, a cam on the end of the handle withdraws the plunger when handle is depressed



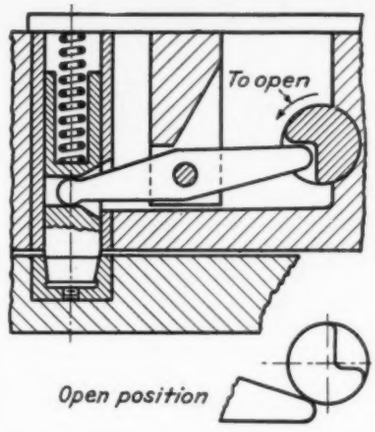
An eccentric pin on the end of the operating shaft moves the locking plunger in this indexing unit



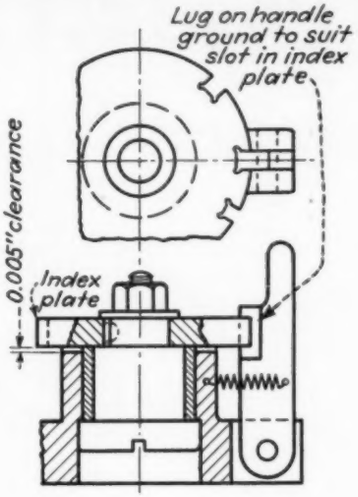
Finger pressure against the end of the lever above the spring is sufficient to raise the locking plunger



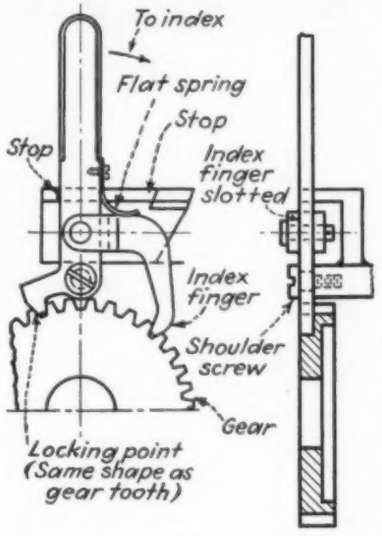
Hand lever actuation of this index locking plunger insures speedy operation, even when spring is heavy



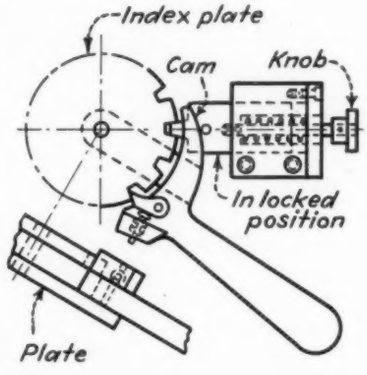
This toggle locking pin arrangement is operated by a lever fixed to one end of the round shaft



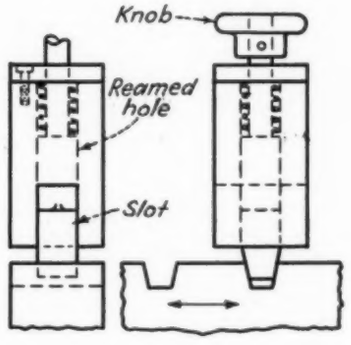
The index plate is turned by hand when the locking handle is retracted; slots in the plate are ground for a snug fit on both sides of handle



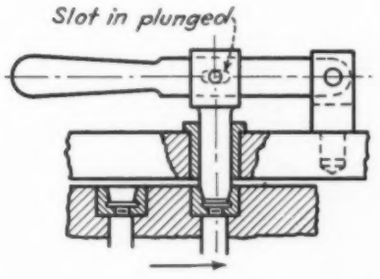
When the handle is pulled to the right against the stop, the locking point is withdrawn from a gear tooth and the indexing finger turns the gear one or more tooth positions



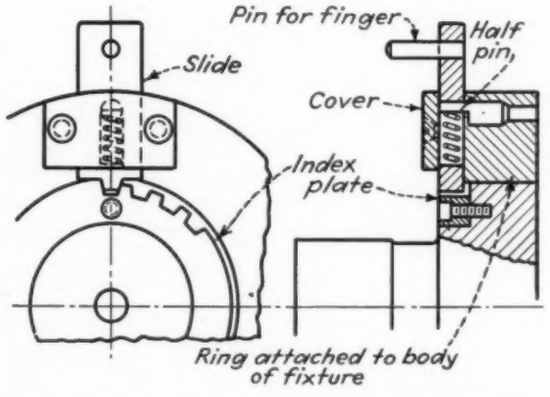
When the handle is raised to index the plate, the cam moves the slide by pressure against a pin. As the handle is returned the latch catches in the next slot and rotates the index plate



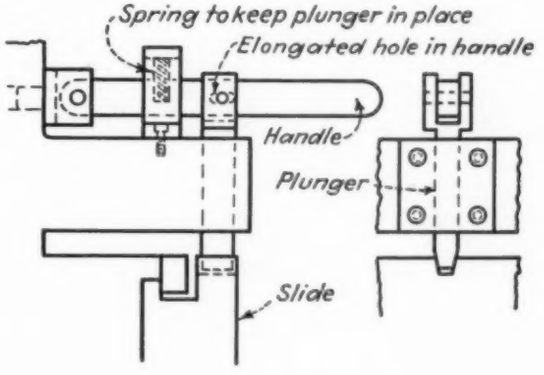
When spring pressure is necessary to hold the locking plunger in position, in indexing slides, this arrangement is usually satisfactory



This arrangement is suitable for locking indexing slides where spring pressure is not needed to keep the plunger in position



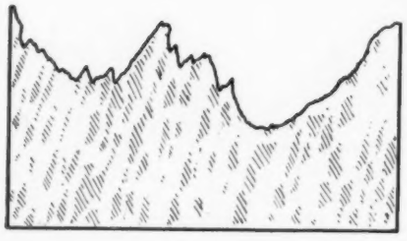
Plates can be locked with a tool steel slide having a tongue ground to fit tightly in the index notches. Spring pressure holds slide against index plate



Where considerable spring pressure is necessary to hold the locking plunger in position for heavy slides, this arrangement can be used

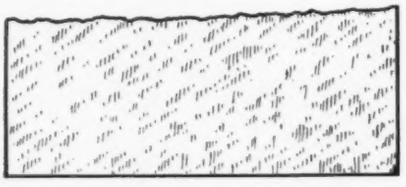
More Cuts by Correct Sharpening

BY ROY T. WISE, DEPUTY MACHINE TOOL CONTROLLER, OTTAWA, CANADA



The cutter tooth shown was sharpened with the right wheel but unfortunately dressed with a carborundum stick which transferred to the face of the grinding wheel all its irregularities, which were in turn transferred to the cutter. When the cutter contacts the work the high points will break off, and the cutter will become dull before it has an opportunity to do any work. A cutter sharpened like this produced 20 pieces before it needed resharpening

A tooth sharpened with the same grinding wheel, but dressed with a dull diamond, still has an irregular surface. Part of the grits were knocked out by the dull diamond, leaving voids that left high points on the cutter tooth. However, marked improvement was shown by the production of 60 pieces before resharpening



Using the same grinding wheel, dressed with a sharper diamond, the sharpened tooth had a straight smooth cutting edge. The diamond was set at 20 deg. with a sharp corner toward the wheel; consideration was given to the grits in the wheel in relation to the traverse of the diamond. In this condition the cutter produced 200 pieces between grinds

Good tools are like good wits.
Keep them keen and angled right;
then they will serve you well

SELECTION, sharpening and correct application are the three steps toward full utilization of a cutting tool both as to maximum production and long life. A previous article gave some data on tool selection (*AM*—Vol. 85, page 1253). That is the first step and an important one; but probably more waste occurs in sharpening tools than in any other phase of their use.

Improper sharpening severely limits cutting speeds and feeds; by reducing the number of cuts between grinds it needlessly shortens the useful life of the tool. Excess stock removal may aggravate the effect so that only a fraction of a tool's capacity to produce will be used before it reaches the scrap pile.

In resharpening milling cutters four major items should be given careful consideration.

1. Relief
2. Land
3. Clearance
4. Finish

Relief or drop off back of the cutting edge should provide maximum support to the cutting edge and be just great enough to clear the work when the proper feed is used. This relief can be best controlled by the use of a dial indicator to find the amount of drop in thousandths. For example: On a profile cutter 4 in. in diameter, the relief on a land $\frac{3}{64}$ in. wide should be about 0.003 in. for milling steel.

Land provides support to the cutting edge. It should be kept to a width of approximately $\frac{1}{32}$ in. for small cutters and $\frac{1}{16}$ in. for larger cutters in order that the relief back of the cutting edge may be as small as possible. When the land is increased by resharpening, it should be reduced to this width by regrinding the secondary clearance angle.

Clearance provides chip space in the flute of the cutter and reduces the amount of material to be removed in regrinding the relief. This angle should be kept as near as possible to the original design of the cutter tooth.

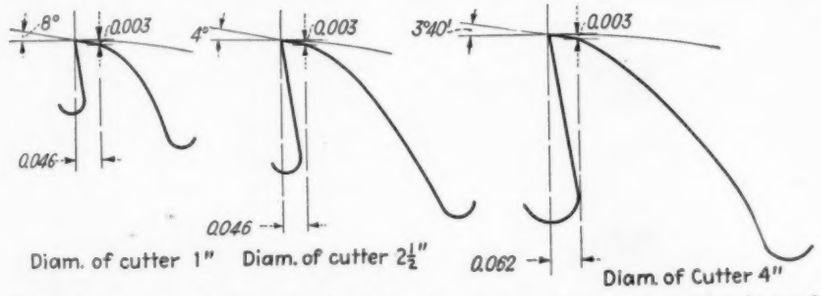
Finish is of great importance. If cutters are sharpened with grinding wheels that leave the edges rough or with "saw teeth" these high points or "teeth" break off when the cutter contacts the work, and the edge will be dull before it does any work. A smooth finish obtained by using the right grinding wheel on the cutting edge will often produce two to three times as many parts as a rough finish.

When these fundamentals are observed in resharpening, the life of cutters is greatly extended.

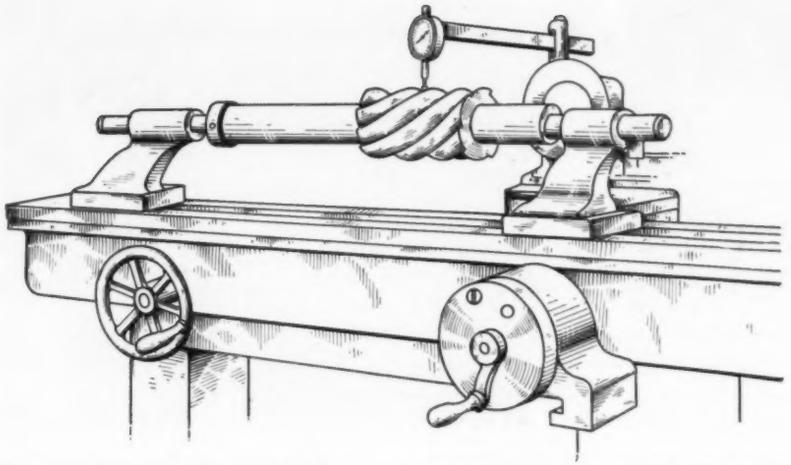
Improper drill grinding may remove more metal from the drill than is necessary and reduce the number of times that the drill can be resharpened.

Four essential items must be carefully controlled:

1. Relief back of the cutting edges.
2. Length and angle of cutting edges.
3. Position of center.



If the angle method of inspecting the relief back of the cutting edge is used, a calculation will have to be made to find the correct angle for each new diameter. On a cutter 1 in. in diameter an 8-deg. angle provides 0.003 drop on a land $\frac{3}{64}$ in. wide. On a $2\frac{1}{4}$-in. cutter a 4-deg. angle, and on a 4-in. cutter a 3-deg. 40-min. angle gives the same results



When an indicator is used to determine the drop in thousandths in sharpened cutters, the element of human error is eliminated. Therefore it is more practical in designing cutters to specify the desired drop in thousandths rather than by the angle method. Indicators are used in grinding and for the inspection of cutters after sharpening

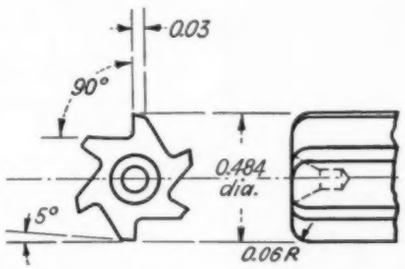
4. Web thickness.

Proper relief back of the cutting edges is necessary to provide free cutting action. This relief should be kept to a minimum, however, so that the cutting edges will have maximum support. The average relief at the circumference should be about 12 deg. for general purposes.

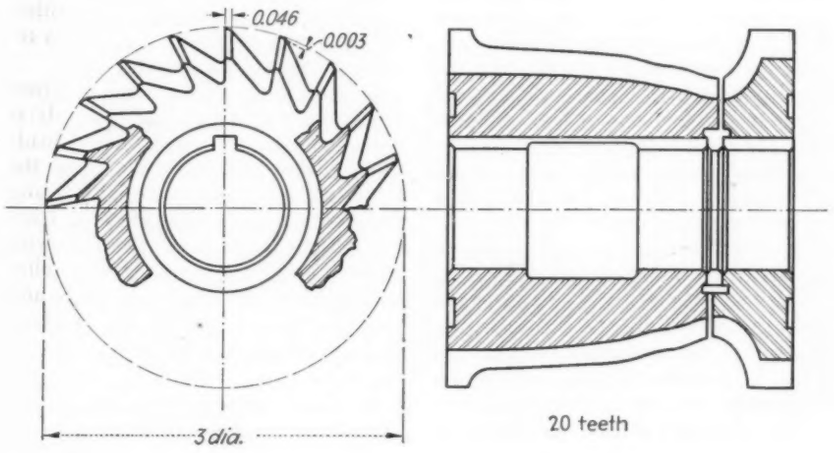
The length of the cutting edges must always be the same, and must be at equal angles to the axis of the drill. Unless these two features are correct the holes drilled will be larger than the drill. The drill will be forced against the side wall of the hole and cause excessive wear on the margin.

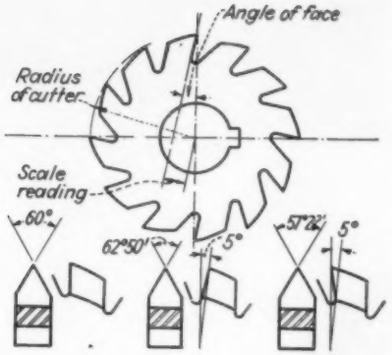
The correct angle for general purposes is 59 deg. (118 deg. included angle). For hard material this angle should be more than 59 deg. and for soft material less than 59 deg. It is good practice to use a gage for controlling the angles and to inspect the position of the center.

The center of the drill should coin-

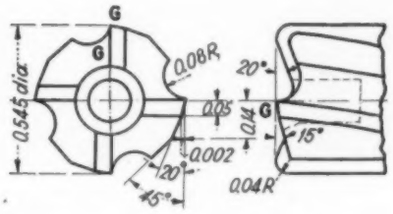


This type of reamer should be used when a blind hole is reamed. It should not be sharpened to a cutting edge on the sides (as shown above) but should have a small cylindrical land because it does not cut on the side. The only place it can or should cut is on the chamfer on the corner. Reamers for through holes should have a left-hand helix and right-hand cut with a lead about 1¼ to 1½ times the diameter. In other words, a ¼-in. reamer should have a lead of approximately ⅜ in. The chips will then flow out ahead of the cut and not score the work



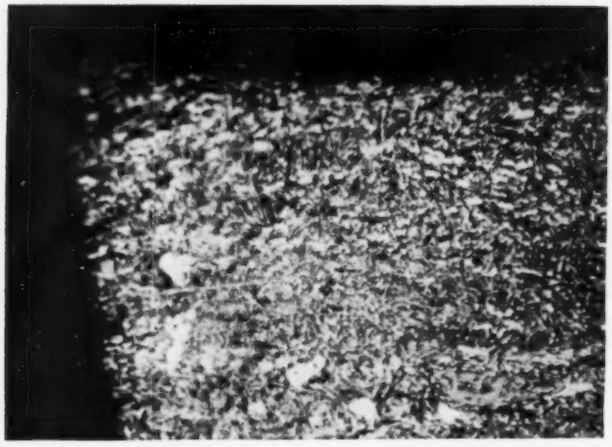


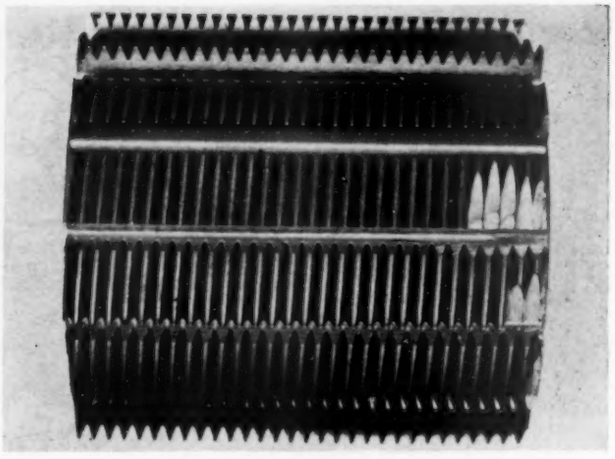
When cutters are made with cam relief and rake angle, consideration must be given to the rake angle when teeth are formed. The teeth will retain their form so long as the face angle is maintained when they are sharpened. If the angle of the face or the helix of the tooth is changed the form of the tooth will also be changed. The standard of most manufacturers for cam relief cutters is approximately 0.200 in. drop in 1 in. circular pitch



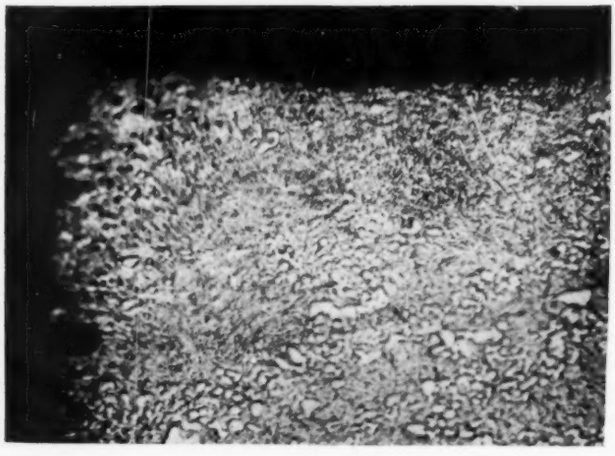
A spline mill does not cut on its sides but only on the end. This should be indicated on all drawings. The lands on the sides of the cutter should be cylindrical and the cutting points clearly indicated. The cutting section is usually a chamfer or radius and should be sharpened a little beyond the depth of the cut which is usually from 0.005 to 0.015 in. per stroke of the spline cutter. The drawing incorrectly shows relief back of the cutting edges

This is a profile form cutter, that is, one made to be ground by profile grinding instead of a cam relief form cutter. This cutter must be sharpened on a machine designed for the purpose and ground to a templet. The face of the tooth is radial and there is no helix to the flute. This type of cutter may be all right for a few parts but no good for large quantities when it should be replaced with a cam relief cutter having helical flutes and a rake angle on the teeth to give better cutting action





This thread cutter was ground in the upper flute with the wrong grinding wheel which "wheel burned" the cutting edge. The lower flute was ground with the correct grinding wheel which did not burn it



After grinding, teeth were broken off both flutes and prepared for photographing their structure. This is the wheel burned structure. It is so soft that it can be filed and will produce about 25 percent as much work as the structure that was not wheel burned

Here is the photomicrograph of the tooth that was not wheel burned magnified 500 times. It has a 64 Rockwell hardness and an excellent structure. When cutting edges of milling cutters, hobs, drills, taps, turning tools and others are wheel burned their value is reduced as much as 75 percent

cide with the axis. If it is off-center, angle, length of cutting edges and position of the web should be carefully inspected. Cutting edges must be at the same angle and of equal length, and the web central, in order to have the center coincide with the drill axis.

Web thickness is an item of considerable importance. Drills are designed with an increase in the thickness of the web from the point toward the shank. This is necessary to provide sufficient strength to stand the strain imposed. The web is literally pushed through the work, and consequently should be made as thin as practical. When the drill has been sharpened a number of times the web grows thicker at the point and should be thinned. Web thinning, especially on large drills, should be done only on a web-thinning machine.

There is no substitute for the proper machine to sharpen drills. It is not good practice to attempt to sharpen drills by hand. The following is an authentic record of comparison of drill performance between hand-ground drills and machine-ground drills. The values in this record represent averages over a period of several weeks and not just a single test.

Drills sharpened by the proper machine will conserve the life of the drill by producing more prices per grind, holes drilled will be the right size, and more of the productive capacity of the drill press can be used.

Drill Performance

Size of Drill: 3/4 in.

Material Drilled: Forged Steel 3½ in. thick

Life of Drill Regrinds:	*Work Performance* *Holes per grind:*	*Total holes:*
102 by hand	Hand, 15	Hand, 1,530
256 by machine	Machine, 120	Machine, 30,720

Cost of Drills: **$2.22 per thousand holes for hand-ground drills. 11 cents per thousand holes for machine-ground drills**

The accompanying photographs show more clearly than words can describe the destructive effects of "wheel burning" the cutting edges of cutting tools.

For the purpose of preparing these photographs, a thread cutter was used because the teeth could be easily removed by fracture. Then photomicrographs were made of the structure taken through the center section of the teeth removed from the thread cutter. The top of the photomicrographs is the top of the tooth and the face of the tooth is on the left.

The vital part of any cutting tool is its cutting edge. When this edge is "wheel burned" the temper is drawn. This vital part of the cutter or tool is then so soft that it will not resist either abrasive wear or impact load. This results in greatly reduced tool life.

Some of the common causes of wheel burning are using grinding wheels at the wrong surface speeds, wheel loading, forcing the cut and using the wrong wheel for the work. Cutting tools of all kinds that are free from "wheel burning" and finished with smooth keen edges and proper relief will produce the maximum parts and increase the capacity of the machine tools on which they are used.

A third article by Mr. Wise will discuss tool applications.

Cylindrical Surface Hardening

COMPILED BY J. G. MAGRATH, APPLIED ENGINEERING DEPARTMENT, AIR REDUCTION COMPANY

How to flame harden cylindrical surfaces is told in detail with an explanation of the alternate processes that may be employed

SHAFTS, rolls, cylinders, liners, sleeves and other parts may be flame hardened inside and outside by the circular band progressive method.

Shafts or rolls, to be hardened on the outside surface are generally mounted on a horizontal spindle providing for the proper circumferential speed. The torch, with an adjusting holder, is mounted for horizontal travel parallel to the long axis of the object being surface hardened. The work can usually be supported on a large lathe spindle, with a speed reduction unit, and the torch with the adjusting holder mounted on the lathe carriage which provides movement parallel to the long axis of the object.

A water-cooled torch with a water-cooled multi-flame tip, having a built-in quench or a separate quench immediately following, is fixed in the holder with the tip at right angles to the face of the work, either from the top (preferable) or from the side, as convenient. The round object is generally rotated on the spindle at a circumferential surface speed past the flames ranging from 2 in. per min. for a hardness depth of $\frac{5}{16}$ in. to 6 in. per min. for $\frac{1}{16}$ in. depth, subject to variation with the thickness of the object heated.

Heated Band Wider Than Tip

The widest tip available should be employed; upon completion of the first revolution, the torch is moved to the proper adjacent position for hardening the next successive band, as shown in Fig. 47. As there will be heat induction for a distance of about $\frac{1}{8}$ in. beyond the center of the end flame, the width of band may be $\frac{1}{8}$ to $\frac{1}{4}$ in. or more, wider than the width of the tip.

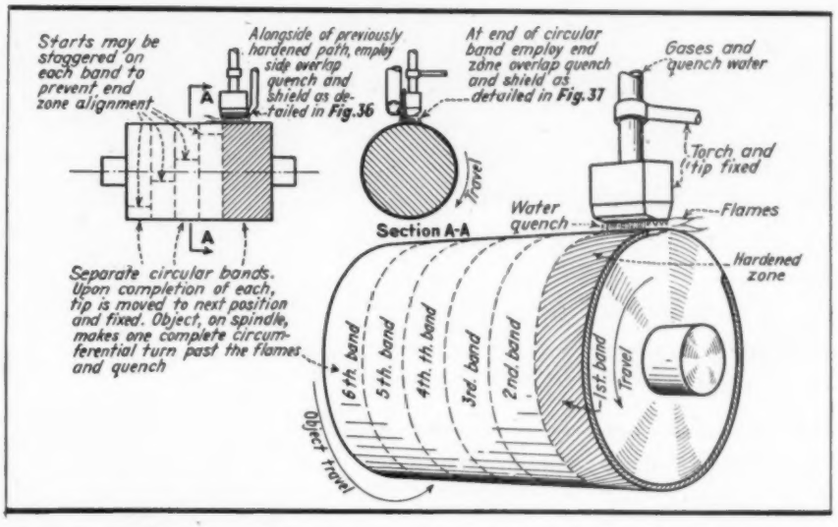

Starts may be staggered on each band to prevent end zone alignment
Alongside of previously hardened path, employ side overlap quench and shield as detailed in Fig. 36
At end of circular band employ end zone overlap quench and shield as detailed in Fig. 37
Gases and quench water
Torch and tip fixed
Travel
Flames
Water quench
Section A-A
Hardened zone
Separate circular bands. Upon completion of each, tip is moved to next position and fixed. Object, on spindle, makes one complete circumferential turn past the flames and quench
6th. band
5th. band
4th. band
3rd. band
2nd band
1st. band
Travel
Object travel

Fig. 47—*This flame-hardening procedure is the circular band progressive method employed on the outside surfaces of rounds*

When starting the first band at the edges of rolls, the precautions advised in a previous installment for protection against edge over-heating must be followed. The same rules apply here as on the flat surfaces. Further the intermediate softened zone between bands will be experienced and these should be minimized by the erection of the overlap quench and shield as shown in Fig. 36 (*AM*—Vol. 85, page 1135).

A further precaution to reduce possible detrimental effect of end-zone softening on circular paths, as indicated in Fig. 37, is the staggering of the start and finish point on each band, with the consequential result of staggered end-zone softened areas as shown in Fig. 47.

One large eastern steel mill conducted a metallurgical survey of the effect of flame hardening by the circular band progressive method on various analysis steels, in order to obtain a definite routine formula for speed of travel versus heat penetration. Two of these experiments have been selected for observation.

Specimen *A* is a Ni-Mo-V steel of 0.33C, 0.66 Mn, 2.93 Ni, 0.12 V and 0.35 Mo. An 8-in. diameter of this material was turned on a lathe spindle at a speed of one revolution in $5\frac{1}{2}$ min. (approximately 4.6 circumferential in. per min.), a speed found to be the best for this particular alloy. As seen in Fig. 48 an average hardened depth of a little better than $\frac{1}{8}$ in. was obtained with a hardness of well over 500 Brinell prevailing over 75 percent of the hardened depth. A study of the photomicrographs in Fig. 49 of specimen *A* will show the refinement of grain structure obtained with this alloy when employing this procedure. Specimen *A* was given a refining treatment (quench and draw) before flame hardening and water quenched after hardening.

Specimen *B* is an SAE 1050 steel of 0.48 C and 0.67 Mn. A $7\frac{1}{2}$-in. diameter was turned on a lathe spindle at a speed of one revolution in $4\frac{1}{2}$ min. (approximately $5\frac{1}{4}$ circumferential in. per min.). An average hardened depth of nearly $\frac{3}{16}$ in. was obtained with a

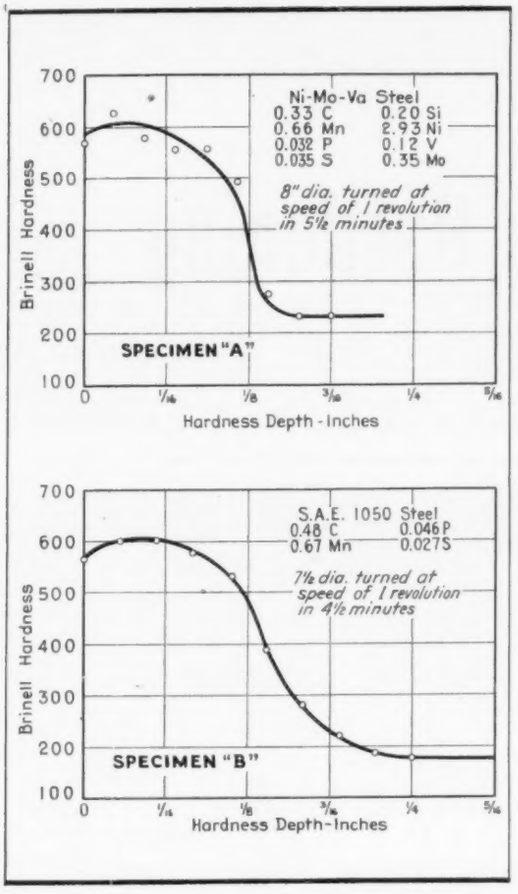

Ni-Mo-Va Steel
0.33 C 0.20 Si
0.66 Mn 2.93 Ni
0.032 P 0.12 V
0.035 S 0.35 Mo
8" dia. turned at speed of 1 revolution in 5½ minutes
SPECIMEN "A"
Brinell Hardness
Hardness Depth - Inches
S.A.E. 1050 Steel
0.48 C 0.046 P
0.67 Mn 0.027 S
7½ dia. turned at speed of 1 revolution in 4½ minutes
SPECIMEN "B"
Brinell Hardness
Hardness Depth-Inches

Fig. 48—*These charts show the Brinell hardness for varying depths of penetration on two specimens hardened by circular bands*

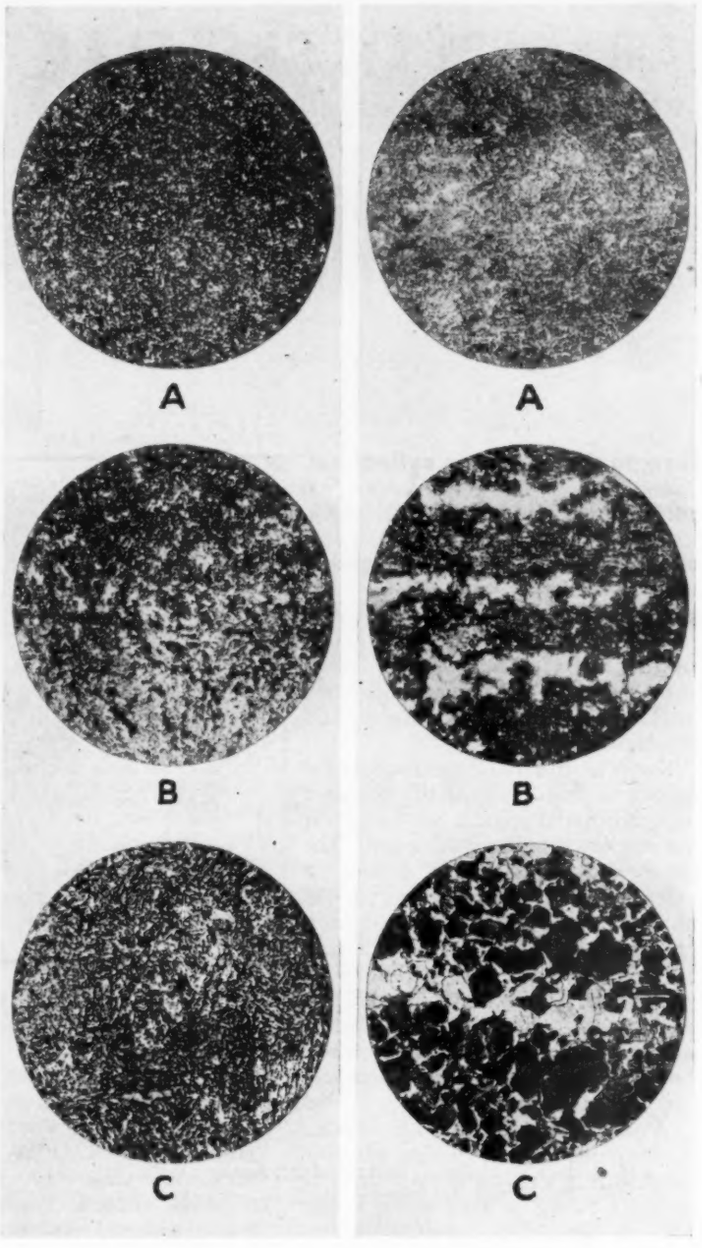


Fig. 49—(*Right*) *Photomicrographs of Ni-Mo-V steel* (*specimen* A) *charted in Fig. 48 discloses:* A—*martensite fine grained structure immediately below the surface;* B—*transition zone;* C—*normal core structure*

Fig. 50—(*Far Right*) *Photomicrographs of specimen* B (*Fig. 48*) *discloses:* A—*martensite structure immediately below the surface;* B—*transition zone;* C—*normal core structure*

hardness of around 500 Brinell prevailing over two-thirds of the hardness depth, and over 600 Brinell immediately below the surface, as indicated in Fig. 48. It will be noted that a broader transition zone prevails in this SAE 1050 carbon steel than in the alloy steel of specimen *A*. It will also be noted in the micrographs, Fig. 50, that specimen *B*, while having a fine grain structure, has not the uniformity that exists in specimen *A*. Specimen *B* was in a rolled condition prior to flame hardening and water quenched after hardening.

Both specimens furnish conclusive evidence that satisfactory surface hardening is obtainable employing circular band progressive flame hardening. Upon completion of these tests the aforementioned steel company proceeded to flame harden the journals of rolls as illustrated in Fig. 51.

Spiral Band Method

For spiral band progressive hardening, the object is set-up on a horizontal spindle in a manner similar to that described for the circular band method. The torch with adjusting holder is mounted on the lathe carriage which provides progressive movement parallel to the long axis of the work.

The tip is directed at right angles to the face of the work, preferably from the top. The object is rotated on its spindle at a proper circumferential surface speed past the flames to provide the required hardness depth. The torch is traveled parallel to the long axis of the object at a speed synchronized with the rotary speed of the object to provide a torch travel equal to the width of the tip, plus $\frac{1}{8}$ to $\frac{1}{4}$ in. or more, for each complete revolution of the round object. This procedure results in a fully hardened spiral band for the full length of the part, as indicated in Fig. 52.

Feed Wider Than Tip

The widest possible tip available should be employed that will allow a workable feed in the cross-feed carriage to provide for the complete spiral. Sizes of tips recommended for various sizes of round objects of different diameters with the horizontal tip travel per revo-

lution of object, are shown in Table XIV. Because of the induction of heat for a distance of about $\frac{1}{8}$ in. beyond the center of the end flame, the width of band, and consequently the horizontal travel per revolution of object may be $\frac{1}{8}$ to $\frac{1}{4}$ in. or more wider than the width of tip.

Edge Quench and Shield

To prevent edge burning at the roll edge and the beginning of the spiral band it is advisable to employ an edge zone quench and shield as detailed in Fig. 53, alternate *a* and *b* designs being applied as shown in Fig. 52, and discarded after the first complete circumferential turn of the object is made. The intermediate softened zone between spiral bands is minimized by the erection of overlap quench and shield detailed in Fig. 36.

The next installment of this series will appear in an early number.

Fig. 51—*Three torches employed on steel mill roll journals provide a circular path about 12 in. wide. The tests detailed in Figs. 48, 49 and 50 gave part of the research data prior to the treatment of these rolls*

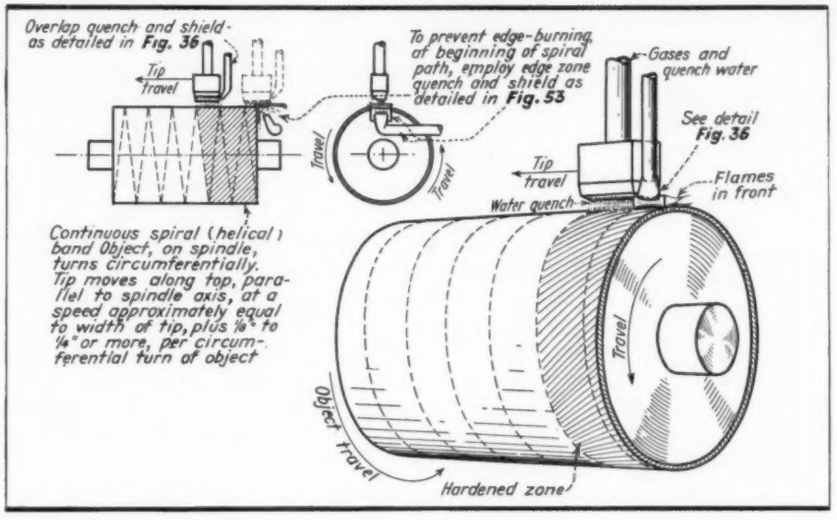

Overlap quench and shield as detailed in Fig. 36
Tip travel
To prevent edge-burning at beginning of spiral path, employ edge zone quench and shield as detailed in Fig. 53
Gases and quench water
See detail Fig. 36
Travel
Travel
Tip travel
Flames in front
Water quench
Continuous spiral (helical) band Object, on spindle, turns circumferentially. Tip moves along top, parallel to spindle axis, at a speed approximately equal to width of tip, plus ⅛" to ¼" or more, per circumferential turn of object
Travel
Object travel
Hardened zone

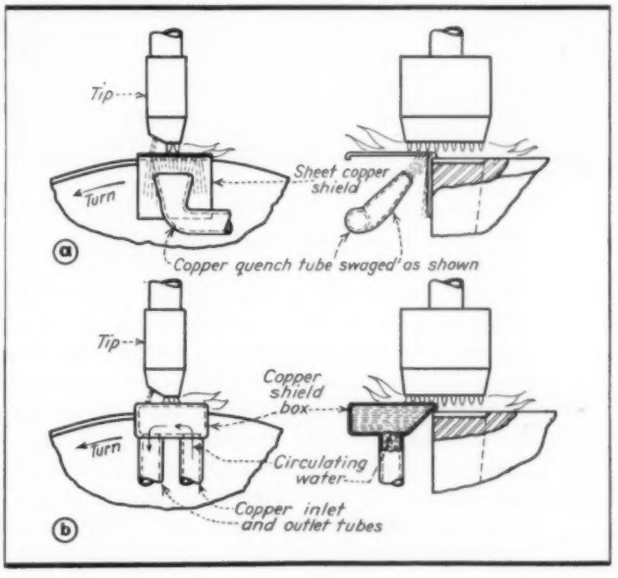
Fig. 52—*Flame hardening may also be applied to the outside surfaces of rounds by the spiral band progressive method*

Fig. 53—*End-zone quench shields are often employed with the spiral band progressive method to prevent burning the edges of the work at the stub. See Fig. 52 for method and position of the installation*

Table XIV—Spiral Band Progressive Method

Diameter of Round Inches	Width of Tip Inches	Width of Band and Horizontal Travel per revolution, Inches
2 to 3	1/2	5/8 to 3/4
4 to 5	3/4	7/8 to 1
6 to 7	1	1 1/8 to 1 1/4
8 to 9	1 1/4	1 3/8 to 1 1/2
10 to 11	1 1/2	1 5/8 to 1 3/4
12 to 13	1 3/4	1 7/8 to 2
14 to 16	2	2 1/8 to 2 1/4
18 to 19	2 1/4	2 3/8 to 2 1/2
20 to 22	2 1/2	2 5/8 to 2 3/4
23 to 25	2 3/4	2 7/8 to 3
26 to 28	3	3 1/8 to 3 1/4
29 to 31	3 1/4	3 3/8 to 3 1/2
32 to 34	3 1/2	3 5/8 to 3 3/4
35 to 37	3 3/4	3 7/8 to 4
38 to 40	4	4 1/8 to 4 1/4

For 30 in. diameter or more, two tips, in series, may be employed to provide a wider hardening band.



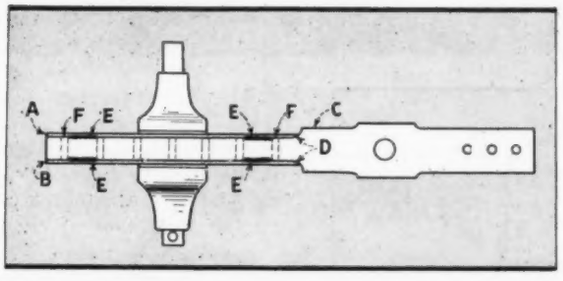
IDEAS FROM PRACTICAL MEN

Simplifying Repairs to Radius-Rod Extensions

BY A. H. CARROLL

New wear plates for square-bar radius-rod extensions on locomotive valve gear are usually held in place with several large clamps preparatory to drilling and applying the rivets. Arc welding has simplified this procedure. Not only are the plates applied more quickly, but they seldom come loose in service. This repair is made as follows:

The bar is held in a vise and after the old plates have been removed, the new ones *A* and *B* are made



Wear plates on locomotive radius-rod extension bars must be kept tight. This can be done by tack welding the plates to the bar before applying and driving the rivets

and matched to the bar *C*. The taper fits at *D* must be made carefully to prevent looseness after the plates have been applied. Since holes are already in the bar, one plate is applied at a time to avoid unnecessary drilling. Each plate is held temporarily in place against the radius bar with a vise, and is welded in four places, that is, top and bottom at each end of the plate. The beads *E* should be about three inches long.

After welding, the new plate is drilled, using the holes *F* in the bar as a guide. When this drilling is completed the bar is returned to the welder and a second plate tack-welded in place. The four holes in the bar are then continued through this second plate.

The holes are then countersunk for drilling. Eight pieces of $\frac{1}{4}$-in. round soft steel, $1\frac{1}{2}$ in. longer than the combined thickness of the bar and plates, are cut for rivets.

To facilitate gaging the length of the rivet to protrude through the bar, a block of steel is drilled with a $\frac{5}{16}$-in. hole exactly $\frac{3}{4}$ in. deep. When the rivet is passed through the hole in the bar and down into the hole in the block, it will be exposed $\frac{3}{4}$ in., which is sufficient to fill the countersink when driven. The rivet is heated with a welding torch. The bar is then turned over, the head of the rivet placed on something solid, and the other end driven home. The remaining rivets are then applied in the same manner. It is imperative that the rivets be driven tight—loose rivets will turn while the bar is being machined and cause trouble.

Before this method of applying radius-rod wear plates was adapted, considerable trouble was encountered in keeping the plates tight. Now, however, this difficulty is eliminated and it is usually necessary to chip or grind the weld from the worn bar to free the worn out plates.

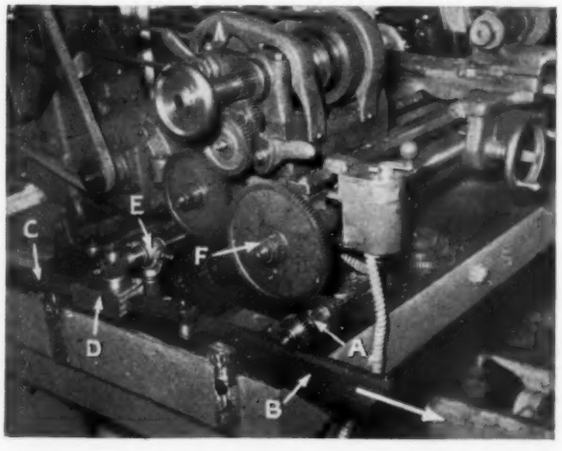
Cutting Fractional-Pitch Threads

BY FRED H. COLVIN

A little shop, the Beacon Tool Works, Mattawan, N. J., had the job of making some special taps with a pitch of 32.6 threads per inch. This was to allow for shrinkage in the hardening of the material to be tapped, and it made a nice problem in moving the thread tool at the proper rate. Ordinary gear calculations were of no help; therefore, the illustrated sine-bar device was designed.

The regular gearing drives the geared shaft *A*, which in turn moves the rack *B*. Pivoted on the flat base of this rack is the sine bar *C*, the back end being supported and clamped on a support that is not shown. The sine bar carries a sliding block *D* to which is pivoted a rod that slides through the pivoted bearing *E* and is fastened to the back of the lathe carriage. The carriage is moved by this rod at the back, the leadscrew not being used at all except to support the large gear *F* that drives the shaft *A* and imparts motion to the rack.

The gear train moves the rack forward, in the



The supplementary gearing, the rack and sine bar on this lathe are used to cut threads of fractional pitch. The lathe carriage is moved by the rod attached to the sine bar

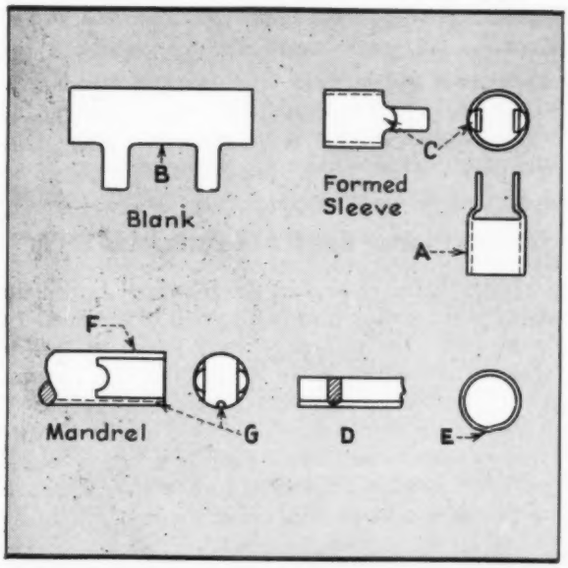
direction of the arrow. As the sine bar moves through the block *D* it moves it to the left and moves the carriage, with its thread tool, toward the head of the lathe.

The combination of the gearing and the angle of the sine bar gives the carriage movement to produce the fractional thread. It means that the tap being cut must revolve 32.6 revolutions for every inch of carriage travel.

Slotted Mandrel Keeps Blank From Slipping

BY DANIEL I. KRAUSS

We had to replace a broken mandrel in a die which was used to form the part *A* from blank *B* shown in the drawing. The part was made from half-hard strip brass 0.043 in. thick. The original mandrel was not satisfactory because the finished part was slightly deformed—this was rectified in designing the new mandrel, which was also of simpler construction.



A round tongued sleeve formed over a mandrel was prevented from slipping by a sharp-edged insert. Resulting deformation was eliminated by using an edged groove instead of the insert

The die used is the well-known horn type in which the horn or mandrel in its downward stroke first contacts the blank, located in a nest, and preforms it into a U-shape between positioned former slides. The latter then moves towards the mandrel by cam action to complete the operation by forming the blank around the mandrel.

It will be noted at *C* in the drawing that the tongue is formed into a hemispherical shape which blends into the body of the sleeve, giving considerable strength to the tongue at this point. This makes it apparent that the blank must register with the mandrel so the tongues will be centralized with the projections which form these surfaces; therefore, some means must be provided to control the movement of the blank until it has been sufficiently formed to prevent it from slipping on the mandrel.

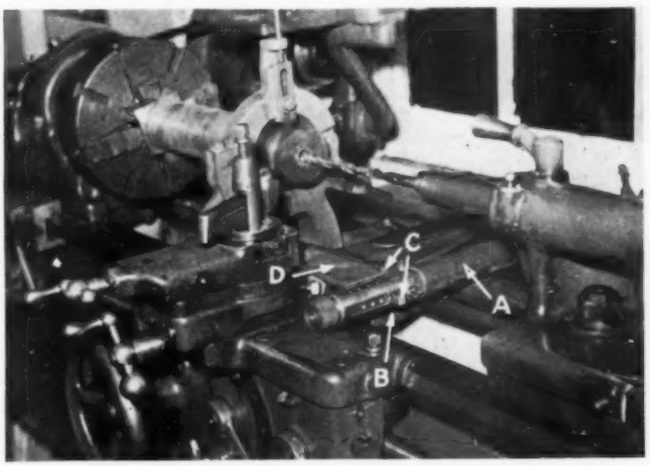
The original mandrel had a slot milled in its lower contacting surface into which was forced a hardened piece of tool steel shaped as at *D*, the sharp edge of which extended 0.006 in. beyond the circumference of the mandrel. This device did prevent slippage but had a few apparent weaknesses—the slot weakened the strength of the mandrel, and part *D* left a decided mark on finished part as well as deforming it as shown at *E*.

The redesigned mandrel is shown at *F*. A shallow groove *G* with a rounded bottom was milled in the mandrel instead of the slot. Since very little metal was removed and the bottom of the groove is rounded, the mandrel is not materially weakened nor likely to crack when heat-treated. The two edges are left sharp and when they make contact with the blank there is sufficient "bite" to prevent slippage. These two edges do not leave noticeable marks and due to the fact they lie on the circumference no deformation takes place.

Cross-Slide Stops Speed Lathe Production

BY FRANK C. HUDSON

Having considerable work which had to be turned to several diameters, one small machine shop made the adjustable cross-slide stop shown in the drawing. The cylindrical body *A* has a flange by which it can be bolted to the saddle, as at *B*. This uses the tapped holes that were put in by the lathe maker to carry the follower-rest.



Four automatic stops are used on this lathe which throw out the cross-feed at predetermined points. This speeds production on jobs turned to diameters for which the stops are set

The front end of the stop bar is flattened on four sides and each side has a series of tapped holes to locate and support the stops, such as shown at *C*. These stops can be adjusted to suit the work as each has a slotted base so it can be set to any desired place on the bar. The front end of the bar has a large

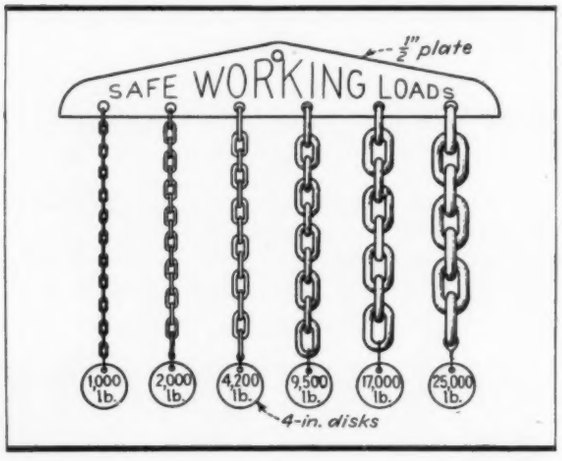
knurled portion by which it can be easily turned to bring any one of the four stops uppermost. The back end of the cross-slide carries a stop plate *D*, held in place by capscrews. Contact between the plate *D* and the capscrews throws out the cross-feed.

The operation is simple and self evident. With the stops set for four diameters it is only necessary to turn the bar to have a positive stop for each diameter.

Safe Chain Loading Shown by Samples

BY E. J. TANGERMAN

A graphic picture of a safe loading for straight lengths of chain of a given size is provided by a sign of the type shown in the illustration. It is essentially a strip of ½-in. steel punched to permit 18-in. lengths of chain to be inserted—the sections corresponding,



Signs similar to this one can be hung in shops to show graphically the safe loads for different sizes of chain or cables

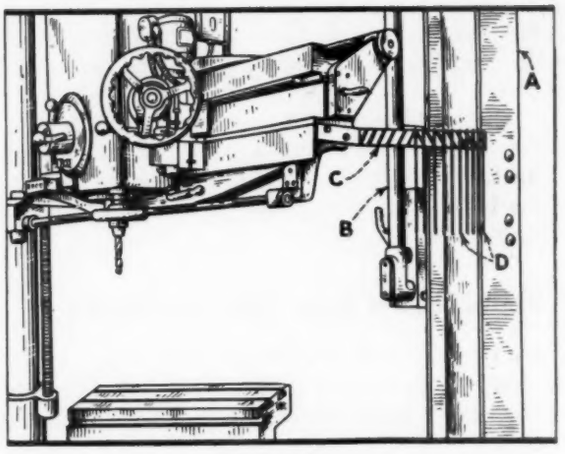
of course, to the sling or chain sizes available. At the lower end of each chain is a 4-in. metal disk on which is lettered the safe working load for that particular size.

Mounted at vantage points around the plant, such safety signs avoid using too light a chain.

Safety Telltale on Radial-Drill Arm

BY T. E. JARNIGAN

In one machine-tool shop, a new radial drill had to be positioned close to a building column *A* and conduit *B*—so close, in fact, that the arm struck them. To avoid damage to the arm, a ½x2-in. bumper bracket *C* was attached as shown in the drawing. But the arm was often at a head-high elevation, so workman after workman struck it. The bracket was painted black with yellow stripes—and the head-cracking continued. Finally, the operator remembered the principle of the old railroad telltale. He suspended a series of 1-ft. cords *D* from the arm, dipped in red lead at their



The arm of this radial drill was often so low that passing workmen would strike their heads on it. To prevent this, a bracket with colored telltale cards hanging from it was bolted to the arm

upper ends and in white lead for the lower halves. Thus, whenever the arm is at a dangerous level, the cords suspended below it are at eye level, and warn the most careless workman in plenty of time.

Reduced Packing Costs with Corrugated Scrap

Sturdy paper cartons by the thousands come into many plants and are used only to feed incinerators. In many cases, the corrugated cardboard from which these cartons are made can serve as excellent packing pieces when shipping products made by the shop.

One of the first projects of the reclamation department of Caterpillar Tractor Company was to collect such corrugated cardboard, and make from it square as well as circular packing pieces.

Spacers and packing pieces salvaged from corrugated cartons in which many companies receive supplies, is one way to save money when reclaiming material. Over 500,000 packing pieces were made from such scrap in this machine last year by Caterpillar Tractor Company

What Can I Do?

EVER SINCE that Sunday morning when havoc swooped from the skies upon Honolulu, a new question has been churning about in millions of American minds. It is this: What can I do to help my country win this war?

This insistent question has pushed aside all matters of personal interest. From now on, individual wants and wishes must give way to the paramount needs of the nation. We all accept that. We have undertaken a huge job. Or, I should say, we have had a huge job thrust upon us. And unless we see that job through successfully it won't much matter what any of us may want.

That job is to win this war.

No longer are we trying to prepare for a war that we may get into. Today we are trying to win a war we're already in—and in up to our eyes. Nothing that any one of us now can do to help himself can get him very much if it does not also help our country to win this war.

I am sure that those who read these words will find many things to do. Some will enlist in the armed services. Some will become active in civilian defense. Some will labor to relieve distress in their home towns. Some will work with organizations set up to serve the men at the front. Each can and will find something he can do.

But this insistent question "What can I do?" goes beyond the individual and his personal service. It re-echoes through the offices and the shops of every American business concern. And what I have to say here is not directed toward individual effort. Rather is it intended for the men and women of American industry who make that industry a living part of American life. Today they are asking themselves: What can industry do? Or better still, what *must* industry do if our country is to finish the job it has started?

Those of us who work in and with American industry have one supreme obligation. We may feel very patriotic; we may be willing to serve "in any capacity;" we may be willing to sacrifice . . . if necessary. But if we fail to meet that one obligation, we shall fail our country in its time of need.

THAT SUPREME OBLIGATION IS AN HONEST DAY'S WORK, EVERY DAY, FROM EVERY MAN, EVERY WOMAN, EVERY MACHINE. . . .

IT IS AS SIMPLE AS THAT!

And that goes for all of us, whether we are engaged in civilian production or working directly on the weapons of war. American victory can be won only through the productivity of American industry.

Efficiency in production is not the responsibility of a few. It can be achieved only as we all put to useful purpose every minute of our time, every ounce of our energy, and every pound of our materials.

This responsibility of industry is the more vital because of what has happened to the business of making war. There was a time when success in war was chiefly a matter of well-trained, well-disciplined armies and competent leaders—when men were everything. In those days, military strength was a matter of strong battalions and able generals. Both still are vital. But today military might is essentially mechanical might. Modern war is an industry just as much as a factory or a railroad. In the first World War, mechanical equipment was relatively simple and limited. But today the special equipment of war and the expert skill needed to use it spell the difference between victory and defeat.

We Americans are not expert war-makers. That is why we must expect to suffer grievous losses before we can win substantial gains. We do not have military training and experience ready to hand when we need them. Neither do we have, ready for action, enough of the machines that are so essential to modern warfare.

So, when it becomes necessary to fight for our lives, we must start from scratch. And today, after a year's effort, we still are not ready to trade blow for blow with enemies who for years have schooled their leaders, trained and disciplined their people, and organized their industries to make war. We shall need more time to develop our strength. And while we are doing that, we must expect reverses.

But there is a brighter side to all this. For it follows that if we are granted this all-important time, the change in the method of warfare is right down our alley. The greater importance of mechanized equipment plays straight into the hand of the world's greatest industrial nation . . . if there is one thing America *does* know, it is industrial production! Our industries know how to produce. They have the skilled manpower. They have the organized facilities. Beyond any doubt, we can produce all that we need to win the victory that we *must* win—if only we are given the time.

THE FIRST RESPONSIBILITY OF THE ARMED FORCES IS TO GAIN THAT TIME FOR US.

THE FIRST RESPONSIBILITY OF INDUSTRY IS TO USE TO THE FULL EVERY SECOND OF THAT TIME IN PRODUCING THE WEAPONS

THE ARMED FORCES NEED TO WIN THE ULTIMATE VICTORY. INDUSTRIAL PRODUCTION IS THE KEY TO VICTORY. BUT IT MUST BE BIGGER PRODUCTION AND FASTER PRODUCTION THAN WE EVER HAVE KNOWN.

Heretofore American industry has worked to produce more of those things which make our lives more enjoyable. Today it must divert much of its energy from the products of peace to the weapons of war.

This change sets up a new yardstick of industrial performance. In time of peace we measure production efficiency in terms of money saved. From now on, we must measure efficiency chiefly in terms of time saved. For the plane, the tank, the gun, or the ship that is ready when it is needed to win a victory, is worth a million times more than the one that is delivered too late to avert a defeat.

Everyone knows how short we are of some materials and machines. But our most tragic shortage is the shortage of time. So whatever we may waste in the days ahead—and unhappily we are bound to waste plenty—let us never forget that the most deadly waste of all is the waste of time.

Time wasted never can be replaced. No one ever has discovered a substitute for time. If we would avoid the waste of this irreplaceable ingredient of victory, we must use every minute of it effectively—*while we still have it.*

That goes for us all. It goes for the man or the woman at the bench, at the desk, at the counter, in the field, or in the executive office. It goes for the politician as well as for the business man. It goes for the humblest and the most powerful. A nation at war cannot carry deadheads. It cannot spare a square foot for any one who will not pull his weight.

In this war, nothing short of complete victory can save the liberties of us all, rich and poor, employer and employee, haves and have-nots alike. The price of that victory is the labor, the loyalty, and the devotion of every last one of us. Winston Churchill said it well for the British people. You know how he said it. I need not repeat it.

All this imposes upon American industry, its owners, its managers, and its workers, the gravest responsibility they ever have assumed. If our country is to survive as a free nation, American industry must rise to that responsibility. If our country should fall, it would fall because American industry fell short of the need. It would be another case of "too little and too late".

This grave responsibility calls for the keenest management industry ever has known. It calls for unremitting research to make the most of our resources. It calls for the reduction of waste to a record minimum: that goes for waste of time, labor, and material. It calls for keeping our machinery working as near to full capacity as we can contrive. It calls for the highest rates of unit production we ever have known. That will mean skillful coordination by management and the most intelligent cooperation that the men in the shops can give. It calls for inventive ingenuity to match that of a nation which has produced some of the world's outstanding technical genius. For this is a war of technical proficiency.

But above all, it calls for a new devotion to the day's work. For so long as we are at war, the day's work will determine our country's security.

Whatever may be our material resources and our technical skill, however resourceful our management, however broad the scale of our effort, industry cannot measure up to its prodigious responsibility if any of us shirk the day's work. Right there is where we find the *one* thing we *all* can do—the one thing that is within the power of each of us.

THAT ONE THING IS SIMPLY TO DELIVER AN HONEST DAY'S WORK WHEREVER WE ARE CALLED TO SERVE. HONEST WORK WILL WIN THIS WAR. LOAFING WILL LOSE IT. THE SHOWDOWN WILL BE WHETHER HITLER CAN DRIVE HIS PEOPLE TO WORK HARDER THAN WE ARE WILLING TO WORK. THERE IS NO ONE TO DRIVE US. WE MUST DRIVE OURSELVES!

Is that so much to ask? It is all our country asks of us, the men of industry. It is all that the men who must work the guns and tanks in the field ask of us. It is all that the men who work our ships and our planes ask of us. "Give us the planes, the guns, the ships, the tanks, and all the rest of our tools," they tell us, "and we'll give you the victory that means so much to us all. But, in the name of that victory, give them to us quickly—QUICKLY—QUICKLY!"

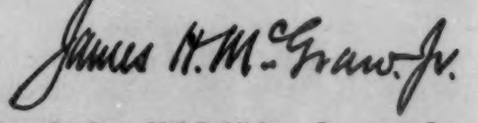
Is that, I repeat, too much to ask of us?

* * * *

To help American industry achieve ever-higher standards of efficiency has been the traditional mission of McGraw-Hill for three-quarters of a century. Normally that effort has been directed toward higher efficiency in the business of peace. But, as in the first World War, twenty-five years ago, it now is directed toward efficiency in the business of war and in every department of American effort that can contribute, directly or indirectly, to the achievement of victory.

And to that mission, I here pledge every resource of this company, its publications, its books, its staff, and every service it is qualified by experience and training to render to American industry, now enlisted in our common cause.

That is what we of McGraw-Hill can do. And that is what we *shall* do to our utmost.



President, McGraw-Hill Publishing Company, Inc.

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Armament

SECTION OF AMERICAN MACHINIST

AIRCRAFT BOMB FUZES

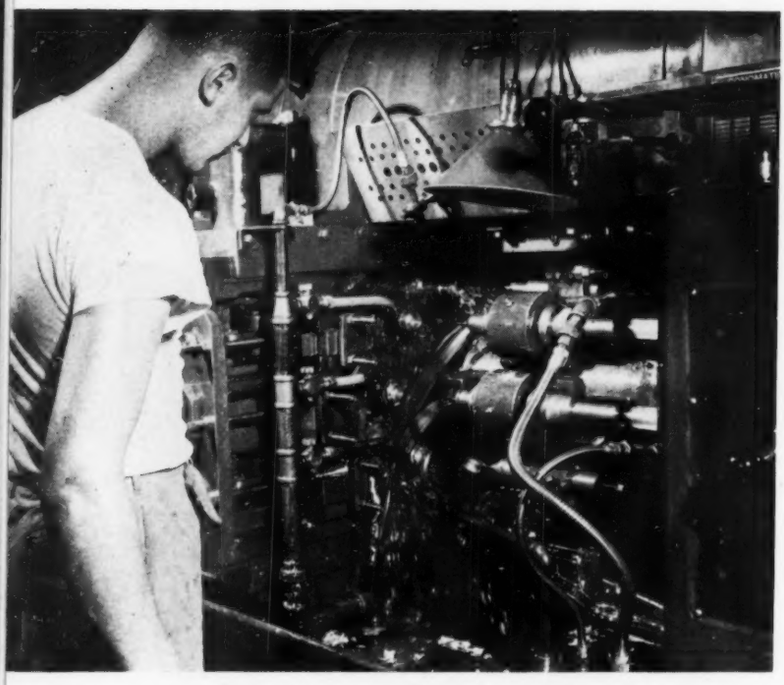
QUANTITY PRODUCTION is no new story to the East Springfield (Mass.) plant of Westinghouse Electric & Manufacturing Company. Its regular output consists of such products as refrigerator units, air conditioners, electric fans, vacuum cleaners and die castings. It is appropriate that a plant whose personnel has this background of experience on small precision parts should now be contributing to the armament program by the manufacture of bomb fuzes.

The M-110 fuze is used on a light fragmentation bomb designed for use against troops in contrast with the heavier demolition or incendiary bombs. The fuze screws into the bomb nose; when the bomb is dropped the fuze is armed by a vane, or small propeller, set in motion by the air current.

The requirements of the bomb mechanism are that it be safe, work easily and accurately. Many of the manufacturing operations are conventional. Of the 28 different parts that go into the fuze, two are made by punch press operation, and most of the others are turned out on automatic lathes.

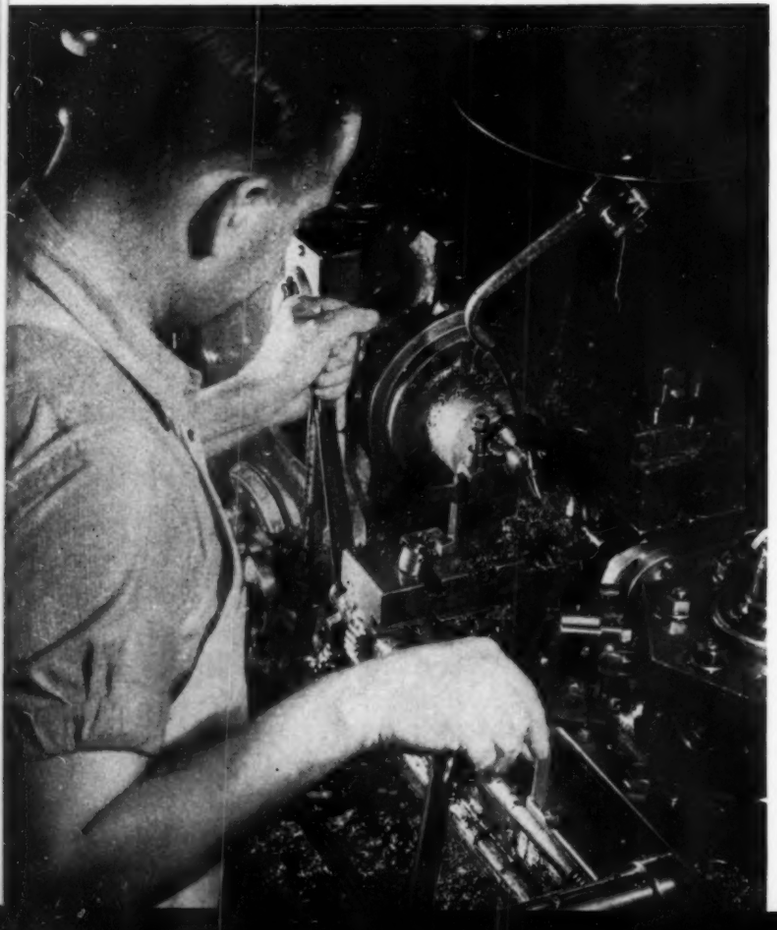
A good example of the effective use of automatic lathes used by the Westinghouse plant are the operations on the fuze body. On this component, made

AIRCRAFT BOMB FUZES



An eight-spindle Conomatic performs the first operation on the aluminum-alloy fuze body. An unusual feature of this set-up is the marking station where lettering is rolled into the workpiece

The second operation on the inner ball race is done on a Warner & Swasey turret lathe. The outer thread is recut and the ball seat finish turned



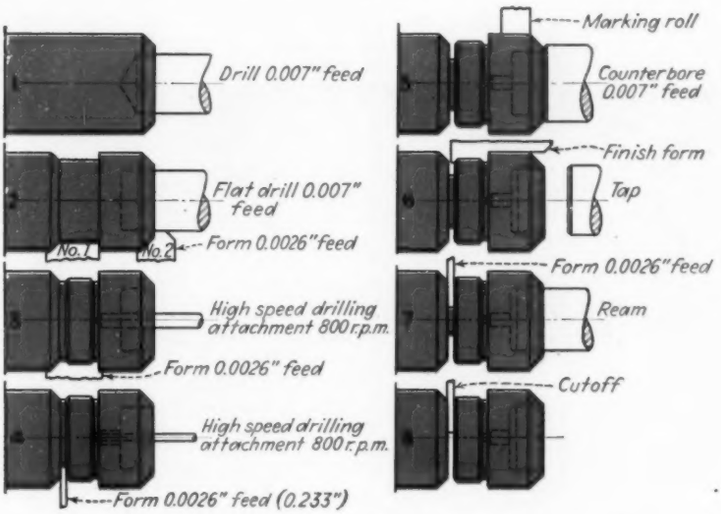
of aluminum alloy, the first operation is done on a $1\frac{7}{8}$-in. eight-spindle Conomatic.

The cuts taken at each station are shown by an accompanying diagram. They consist of drilling, tapping and reaming the bore, while the outside is formed on all diameters. In addition the designation of the fuze is marked on the largest diameter by means of a roll at station No. 5. This roll is brought in contact with the revolving work for a fraction of a second while it presses the lettering into the fuze body; then the roll is withdrawn and returned to its initial position by means of a spring. A light forming cut which follows the marking roll removes any burr that may have been raised by its action. Seven turret tools and eight cross-slide tools are used in this set-up, the latter including the marking roll and the cut-off tool. Approximately four parts per minute are produced at a spindle speed of 580 r.p.m.

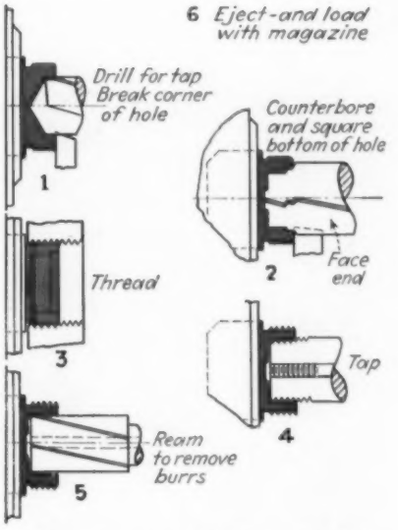
The second operation on the fuze body is done on a $1\frac{5}{8}$-in. six-spindle Acme-Gridley. This machine is equipped with hopper feed. It has a 1075 r.p.m. spindle speed and turns out approximately six fuze bodies per minute. Because of the hopper feed, this machine has an ejecting and loading station. At the other stations, the bore is drilled, counterbored, tapped and reamed, while the outside is threaded using a self-opening die head. A diagram of this tooling is also given. The only other operation on the fuze body is to drill two small holes for a small bracket through which a safety wire is passed. Since drive screws have been adopted for the assembly of this bracket, it is no longer necessary to tap these holes. The holes are drilled on an Allen machine using a simple jig with two base surfaces which can be set on the drilling machine table successively for each of the holes.

Another part, made on an automatic lathe, is the inner ball race. This part is made on a $1\frac{1}{4}$-in. six-spindle Conomatic from steel bars having specification WD X-1314. The machining steps in this set-up are also diagrammed and consist of spotting, drilling, reaming and tapping the bore, and forming and threading the outside diameters. Production is approximately four per minute at a 660 r.p.m. spindle speed. A small slot is cut into the outside thread, using a hand milling machine. Then the piece is chucked on an expanding arbor in a No. 2 Warner & Swasey hand-turret lathe. Here the piece is rethreaded to get rid of the burrs formed by the milling operation, faced and rough finished in the ball seat which must be kept very smooth.

The arming hub, another part made on a Conomatic, uses $1\frac{3}{16}$-in. half-hard brass bar stock as the raw material. A $1\frac{1}{2}$-in. four-spindle machine drills, step-drills and threads this part before cutting off. Here

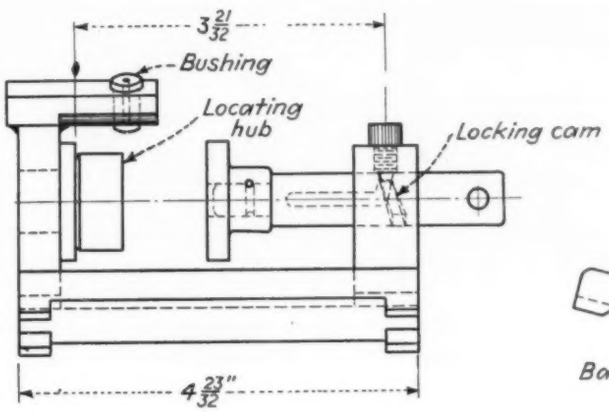


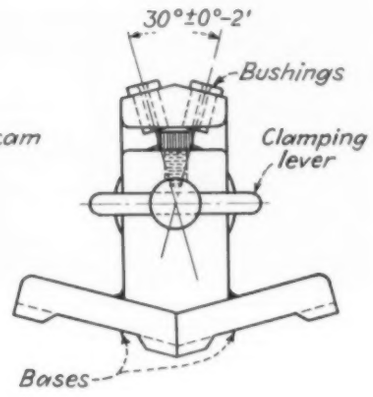
The tooling set-up used on an eight-spindle Conomatic for machining the fuse body includes a marking device at station No. 5

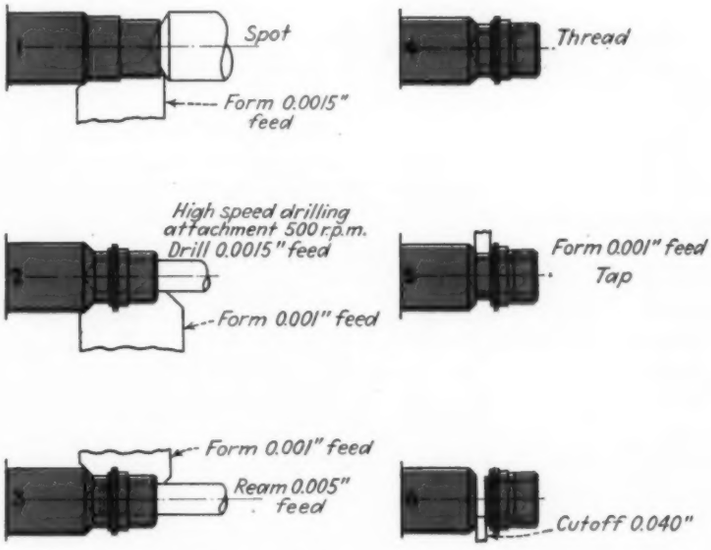


A six-spindle Acme-Gridley automatic equipped with a hopper feed performs the second operation on fuze bodies

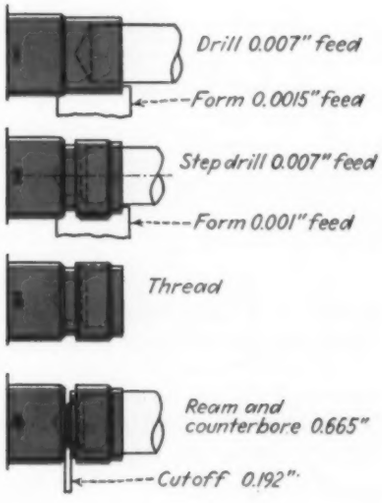
Two angular holes are drilled in the fuze body by a double-base fixture which locates the work from the bore



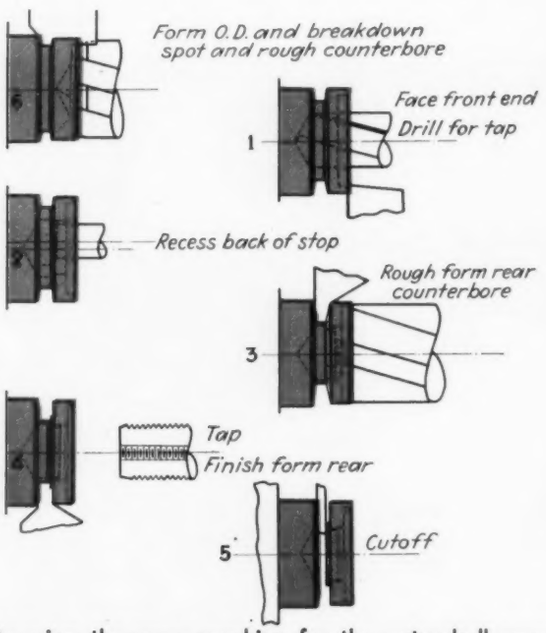




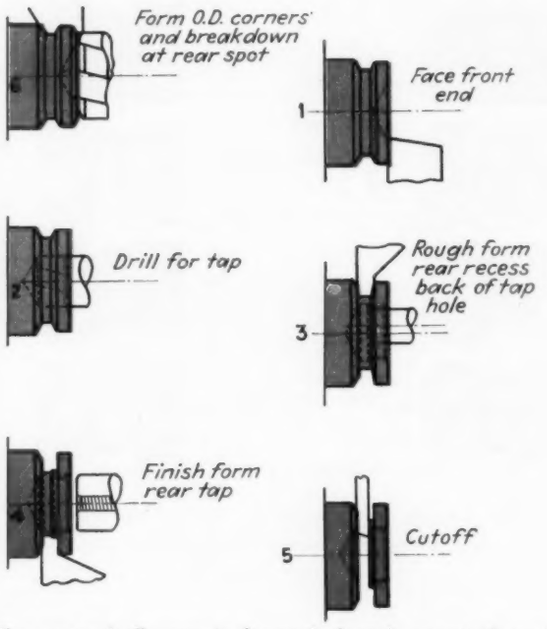
The inner ball race is first machined in a six-spindle Conomatic with a conventional tool set-up



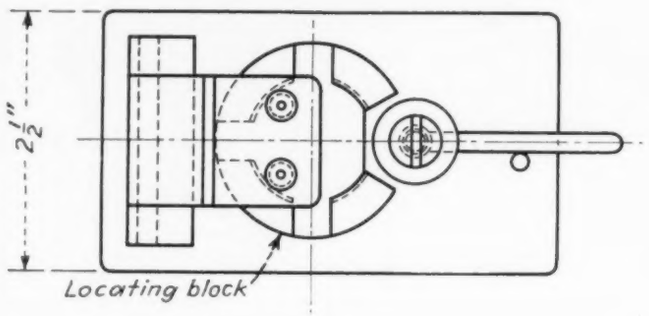
Still another part made in a Conomatic is the arming hub. This is a four-spindle machine working on half-hard brass

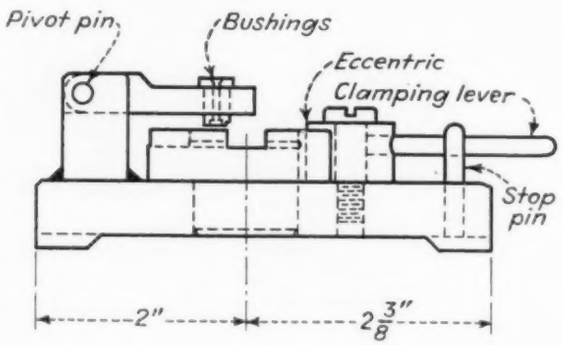


By using the same machine for the outer ball race and nut tool changes are kept to a minimum since these parts are alike in several dimensions

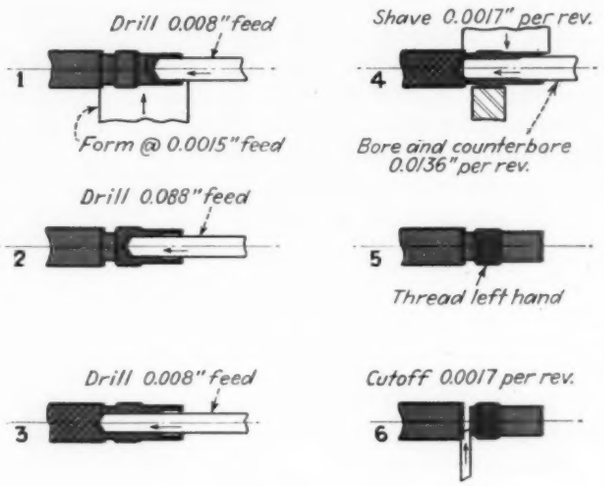


The outer ball race is formed, faced, counterbored and tapped on a six spindle Acme-Gridley



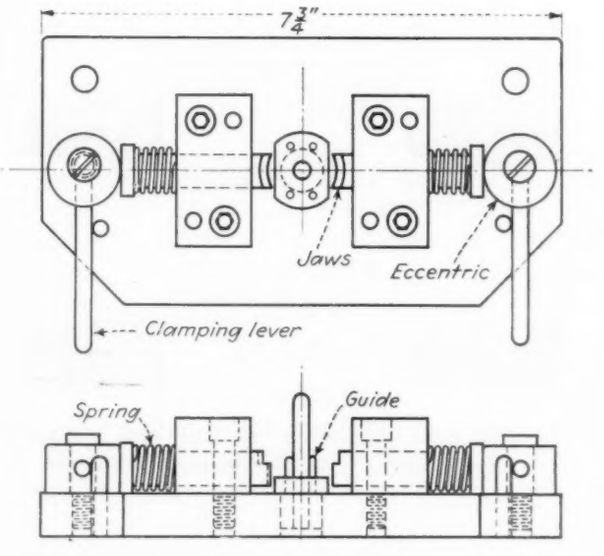


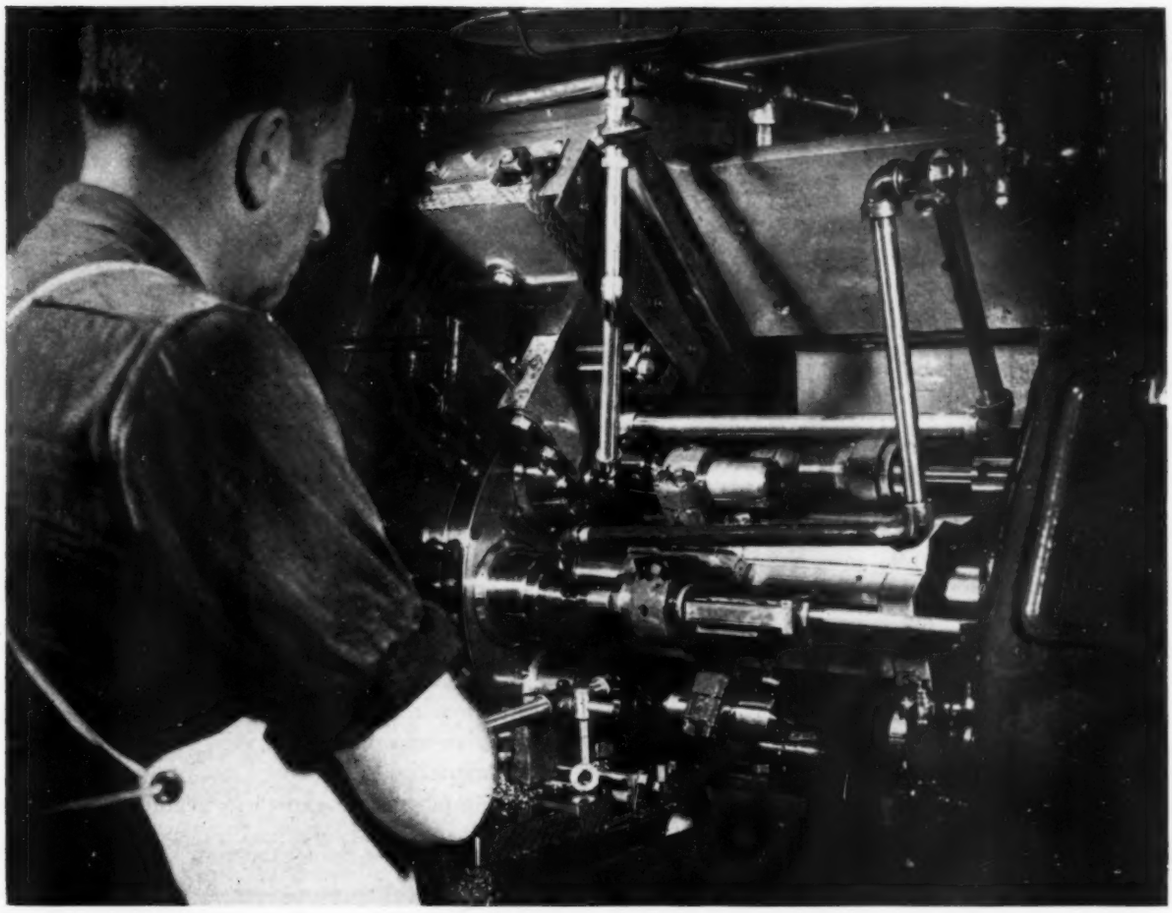
A leaf jig is used when drilling the outer ball race with the part clamped by means of an eccentric



(Right, above) The brass arming sleeve is drilled, formed, shaved and threaded at high speed in a six-spindle New Britain Automatic

(Right) Safety blocks are held two at a time in a fixture while grooves are cut in them by means of a hollow mill held in a drilling machine spindle





Both the outer ball race and the nut are made on this Acme-Gridley automatic. Since the bore and thread are the same size on both parts, only the forming tool for the O.D. need be changed

the elapsed time per piece is about 21 sec. For the second operation the arming hub is mounted on an arbor in a Porter-Cable lathe, while a three-step tool finishes the gear seat to accurate length and diameter.

A 1¼-in. six-spindle Acme-Gridley turns out the outer ball race and the nut. These parts are made in the same machine since they use almost the same tooling. The tapped holes are the same size and have the same thread; the chief difference between them is the outside forming tool. For either part, production is five a minute at a 440 r.p.m. spindle speed. Both parts are of $1\frac{3}{16}$ in. WD X-1314 steel.

For clamping purposes at assembly two holes are drilled in the face of the outer ball race. These holes are machined on a Delta sensitive drill using a simple leaf jig which has a hand-operated eccentric to hold the work. In a second Delta machine the holes are chamfered by holding them against the tool in the spindle.

The firing pin, also of steel, has the point formed and is cut off in a No. 00 Brown & Sharpe automatic. With the pin located from the point, a small hole is drilled near the point. A grinding operation in a Cincinnati centerless machine gives the pin a good finish and removes any burr left by the drilling operation. The end opposite the point is then knurled in a Waterbury-Farrel thread-rolling machine. Points of these pins, including the hole are inspected 100 percent by means of a Jones & Lamson comparator.

The arming sleeve is a brass part made on a New Britain Model 60 1×5-in. six-spindle automatic screw machine. At 3280 r.p.m. spindle speed this machine turns out about 25 pieces per minute. The cuts taken consist of three drilling operations, forming, boring and counterboring, threading and cut-off.

A number of other parts for the bomb fuze are made in automatic lathes, but the examples given will serve to show the efficient tooling used and the method of adapting it to this particular kind of work.

The safety blocks, of which there are three for

each bomb, are 120-deg. annular segments which fit together around the firing pin. They are made of aluminum alloy, and their quantity is sufficient to use extruded bar stock. By this means the cross-sectional shape is already determined which greatly reduces machining time. Six blocks are cut off simultaneously in a U. S. milling machine by means of a multiple-saw set-up. The blocks are then tumbled in a barrel to remove the burrs. Each block contains a circular groove. In order to cut this groove the blocks are mounted, two at a time, in fixture where they are held against a central arbor by means of eccentric cams while being cut by a hollow milling tool. This fixture is used in connection with a hand-feed Avey sensitive drilling machine.

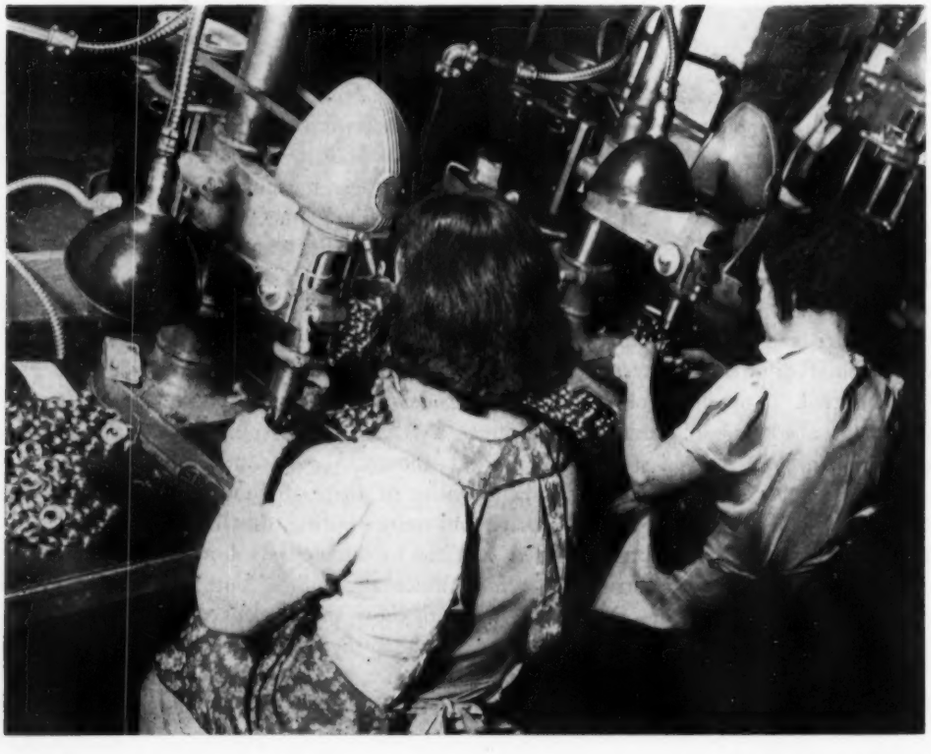
In making the sheet-metal pieces for the bomb fuze standard practice is followed. For example the booster cup is made from sheet duraluminum in a No. 6 Toledo press. A combination die blanks and forms the cup in one operation; the drawn pieces are blown into a tote box by means of an air hose operated by the press. The booster cup and other press-made parts are thoroughly cleaned by passing them through a continuous Blakeslee washing machine which uses an alkali solution for cleaning, followed by a cold water rinse and a hot water rinse to aid drying. The cups are trimmed, threaded and chamfered in a No. 4 Warner & Swasey hand turret lathe with the work held by the outside diameter in a spring collet.

The firing-pin springs are made in a Sleeper & Hartley machine. They use 0.026 in. music wire and are about $\frac{1}{8}$ in. in diameter and $2\frac{1}{4}$ in. long. The brass gears and pinions which go into the bomb fuze assembly are purchased by Westinghouse from a clock maker.

All parts of the bomb fuze are made of aluminum alloy, brass and steel. With the exception of a helical spring and a flat spring, all steel parts are of WD X-1314 specification. These parts are cadmium plated before assembly.

It is important that the thickness of the cadmium plate be sufficient to prevent rusting under very trying conditions. Hence the process is closely controlled. For the purpose a Udylite plating tank is used in which the barrel and work are both cathodic. This arrangement gives a closer control of the effective current density in plating. Depending on the size of the piece, from 1,000 to 2,000 parts are loaded into the barrel at a time. They are plated for half an hour which gives them 0.0002 in. thickness of cadmium.

Firing pins, because of their fragility, are not put in the barrel, but are held in special containers,

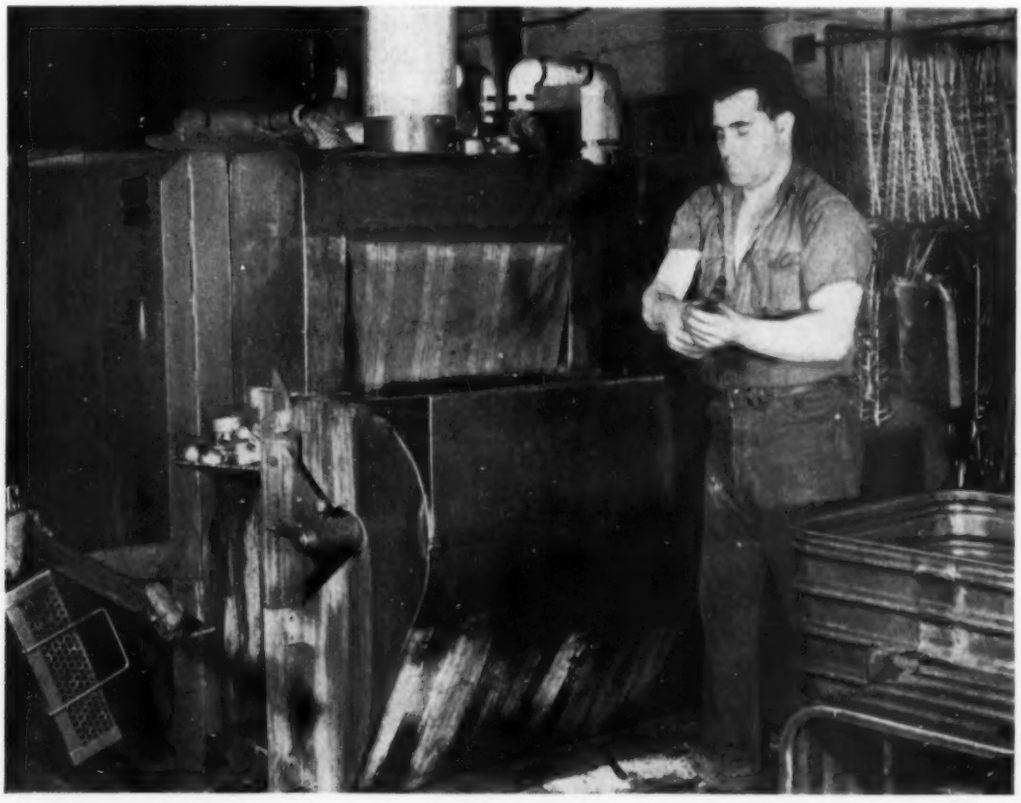


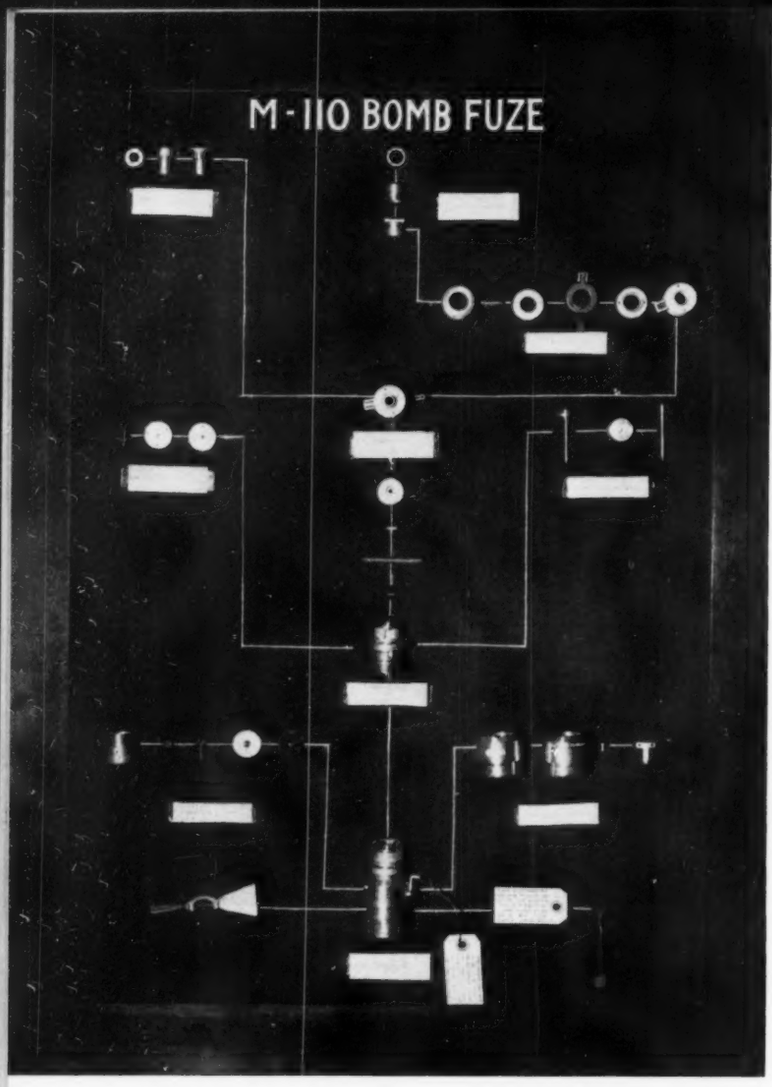
Delta drills do many of the minor operations on the fuze parts. At the left the outer ball race is jig drilled and at the right, the nut is chamfered

Safety blocks are trepanned, or hollow milled, two at a time in an Avey high-speed drilling machine using a simple locating fixture

Firing pin springs are formed from a reel of music wire in a standard Sleeper & Hartley machine

Stamped metal parts, such as primer caps and vanes, are cleaned and rinsed in a continuous conveyor-type Blakeslee unit



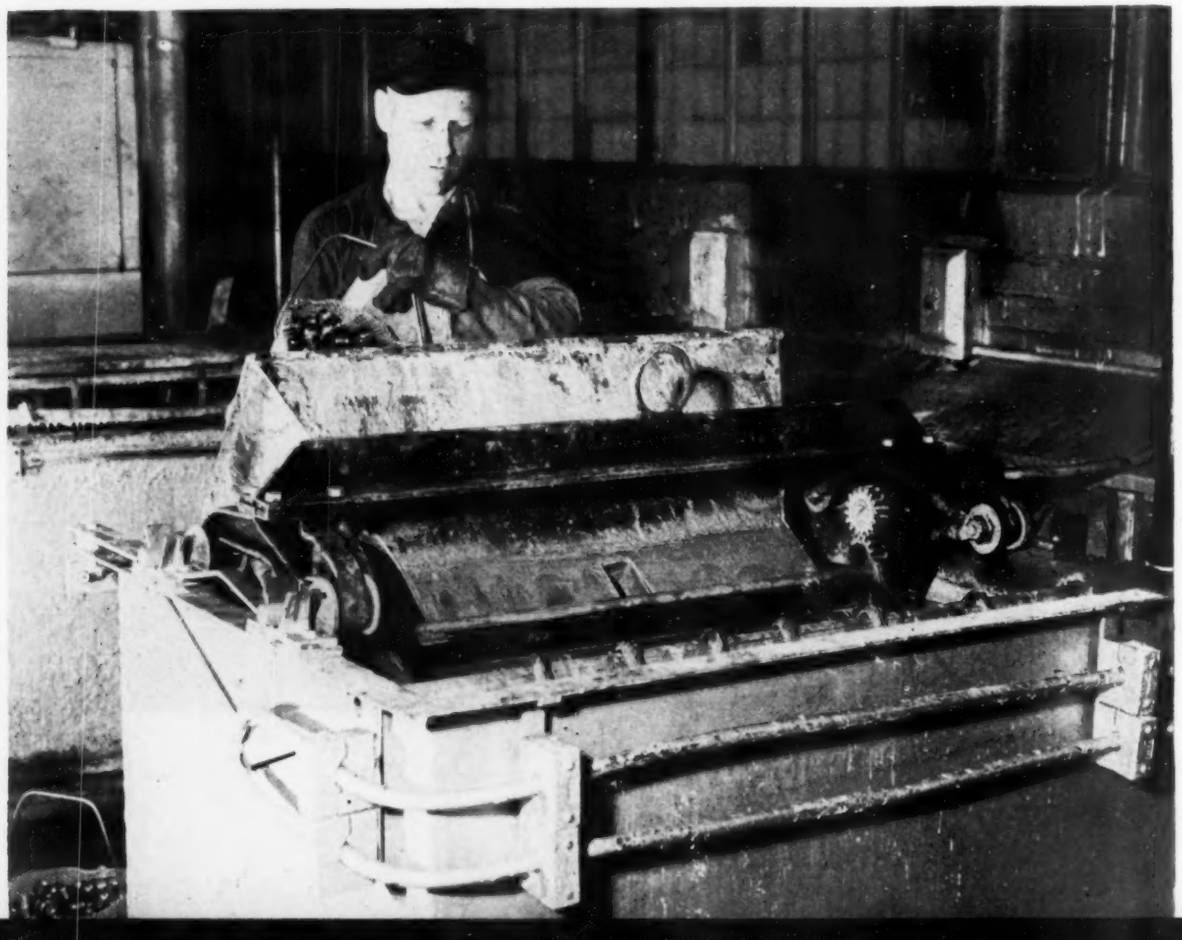


and are passed through a continuous plating tank. In order to check the plate, one percent of each day's run is given a 24-hour salt-spray test. The process has been developed to a point where no rusting shows up even under these severe conditions. The wire frames that hold the parts during this test are protected with ten coats of Nichrome 1W stop-off lacquer which gives them a long life. They are hung in the spray tank over glass rods.

A good deal of interest in the M-110 bomb fuze manufacture lies in the assembly and testing operations. Assembly is done by girls at a long table, along which the parts are passed after each operation is completed. In order to facilitate the handling of parts that must be passed across the table they

The board, using the parts themselves, shows the work flow. Sequence, reading left to right in each horizontal row, is: arming sleeve and gear assembly; arming hub and gear assembly; outer ball race assembly; back plate and pinion pin assembly; outer ball race and arming sleeve assembly; firing pin and striker plate assembly; outer ball race and firing pin assembly; booster cup assembly; body and bracket assembly; final fuze assembly

All steel fuze parts are cadmium plated to rust-proof them. Many of them are put through this Udylite barrel which handles 1000 to 2000 pieces per batch



are pushed along long slides which lead from one working position to another.

To show just how the fuze is put together, a board has been arranged with all the parts in the sequence in which the subassemblies are built up, and in turn become units in the complete assembly. This board is reproduced here, although some of the parts are small and can be seen only with difficulty. However, the captions will serve to clarify the sequence of assembly operations.

The arming sleeve and gear are assembled in a simple hand arbor press, which presses the two components together and stakes them after assembly. The gear is placed on the table of the press with the sleeve above it. The operator gives one turn of the handwheel to apply the pressure for the force fit and then pulls out a slide which brings a die with four beveled edges under the end of the sleeve that has been forced into the gear. A second sharp turn of the handwheel forces the sleeve against this die which produces four radial grooves and expands the metal sufficiently to lock the sleeve in the gear.

Another arbor press is used for assembling the firing pin to a component made of aluminum alloy known as the striker plate. This plate strikes the ground when the bomb is dropped to force the pin against the detonating cap.

Since the end of the pin is knurled, pressing it into the striker plate is sufficient to hold it without staking. However, in order to make certain that the pin and plate are at right angles to each other, the table of the press is provided with a spherical seat. This gives the plate an opportunity for self alignment. The operation is shown at the extreme right of the general assembly table view.

At the near position at the right of the table illustrated, where no operator is working, the back plate is assembled to the pinion pin. This pin acts as the shaft of a pinion which meshes with the two differential gears. Since one of these gears travels axially while in mesh with the pinion, it is essential that the pin be straight. For this reason, the subassembly is 100 percent inspected in a Jones & Lamson comparator. Following the usual practice in using this instrument, an enlarged view of the part is scribed on a transparent templet. Then when the shadow of the end plate and pin is projected on this same templet, a comparison can at once be made to see how the actual assembly conforms to the theoretical outline.

One bump on the arbor press ram assembles the arming sleeve and gear; a second bump, with the slide withdrawn, stakes them together

The pinion pin must be square with the end plate so this subassembly is checked in a Jones & Lamson comparator. Pins out of true are straightened

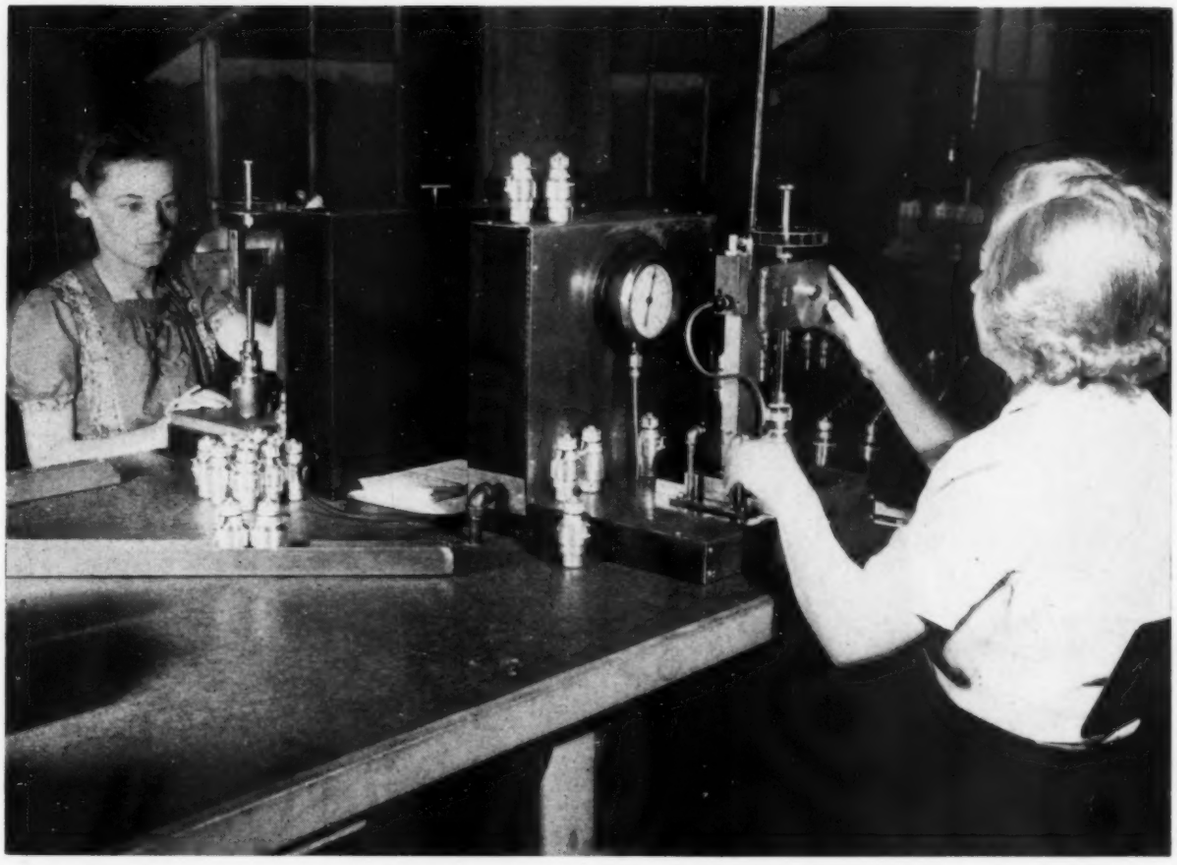
Twenty-eight balls are released each time the work-supporting slide is pushed forward. They are fed into the ball seat

The arming sleeve is run into the arming hub by means of a spindle which rotates when pushed forward against spring tension

Another interesting subassembly is that of the ball bearing formed by the arming hub, the inner ball race and the outer ball race. The inner ball race and the hub are mounted on a slide which is connected by a link mechanism to a container which holds the balls. When the operator has these two pieces in position, she pushes the slide forward which, by means of a pivoted arm and ratchet, rotates the receptacle which holds the balls and spills some of them into a tube. The forward motion also stops off the balls that are already in the tube. In this position the operator presses a release at a second stop-off position, spaced a distance from the first stop-off point so exactly 28 balls run down into the inner race. When the operator withdraws the slide and releases the stop, the upper position is automatically opened and the tube will be again filled with balls for the next assembly. The nut is added by means of a wrench to hold the subassembly for subsequent operations.

While a great deal of the assembly work is necessarily manual, mechanical help is given where possible. For instance, in screwing the arming sleeve into the arming hub, the fine threads called for in the design necessitate taking a large number of turns. Accordingly, a motor is set up with a simple conical friction disk on the armature shaft. When the friction wheel of the working arbor engages that on the motor the arbor is driven, and runs the arming sleeve into the hub in short order. At this point the safety blocks are added.

After the remaining subassembly and final assembly steps are completed according to the layout board, the fuzes are tested. One part of the fuze is fixed to the bomb, while the other is rotated by means of a vane. In order to imitate this procedure under test conditions, a small vertical air turbine is set up which runs one member in relation to the other, including the differential gear mechanism. Simply by moving the position of the air nozzle that drives the turbine wheel, the operator can reverse the direction of this motion. The movable part of the fuze



Every fuze is given 70 turns in each direction to determine its freedom of action. Two small air-driven shafts spin the fuze parts

is given 70 turns in one direction and 70 turns in another as indicated by a worm on the turbine spindle which meshes with a segmental worm wheel having 70 teeth. The operator can readily see by this indicating wheel when the worm wheel has traveled the required distance and reverse the air jet to bring the fuze back into the full assembled position.

At this point Army inspectors examine each fuze and check its functioning. Then the assembly is locked together by staking the fuze body into a groove milled into the inner ball race. In order to seal the assembly, a wire is run through the bracket in the fuze body and the flat spring that fits just above the outer ball race. This spring prevents relative motion between the two parts of the fuze while the wire is in place and later serves as a quick means of assembly for the propeller vane. The fuzes are packed for shipment 100 to a carton with the vanes packed separately. They are not put together because the fuze must first go to a loading plant for the detonating and priming charges before it is ready for use. However, the vane simply slips into the space allowed for it and two lips on the flat spring snap upward and lock it in place.

As an additional check on the functioning of the fuze, a certain number of units are taken from each day's production and are given a wind tunnel test. This test is designed to reproduce as nearly as possible the action of the mechanism when a bomb is dropped. The fuze is held in a bracket threaded the same as the bomb nose and hinged to a vertical support. The air is supplied through a sheet-metal vent pipe by a motor-driven blower. The bracket which holds the fuze is pivoted so that it can be swung into the air stream at the same instant that a stop watch is started. The time that it takes for the safety blocks to fly out of position is recorded. This simple test, designed to simulate service conditions, acts as a check on the many inspections which fuze parts and assemblies must pass. The satisfactory performance of this product reflects the excellent workmanship of the Westinghouse operators and inspectors.

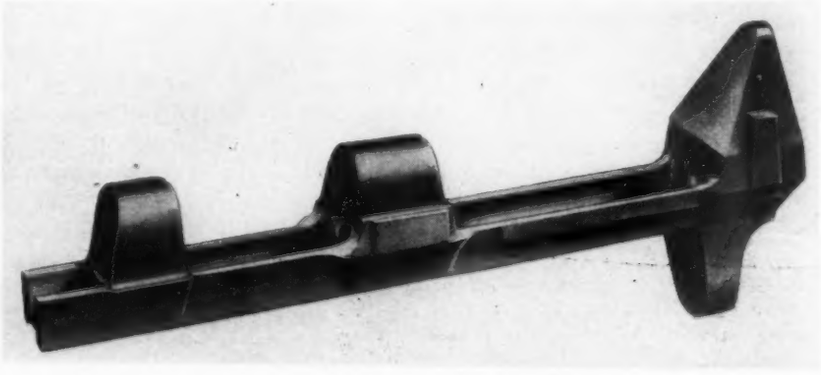
A 20,000-lb. hammer produces the forging using a double-cavity die

Big Forging for Tank Gun

BY HERBERT CHASE

AMONG THE numerous forgings being produced for armament and other applications by the Kropp Forge Company, that known as the "slipper" for a 40-mm. tank gun mount is of unusual size. It weighs 222 lb. and involves a considerable flow of metal; three heavy portions are spaced apart by much lighter ones of considerable length. The material is SAE 2340 bar stock heated to forging temperature in a box furnace; the forging is completed in a single heat. All the work is done under a 20,000-lb. Chambersburg hammer, said to be one of the largest in use west of Pittsburgh.

The die employed has two cavities in the first of which the stock is roughed forged. Next, the piece is drawn or rolled over an edge formed in the die, then it is blocked and finish-forged in the final cavity. The forging is transferred immediately to a 600-ton Toledo press where it is trimmed and restruck. All this work is performed by a five-man crew which handles the stock and forging with trolley tongs. After forgings have cooled they are Magnafluxed to make sure no flaws are present.



The 222-lb. finished forging is used to make the "slipper" for 40-mm. tank gun recuperator mechanism

Schools Pre-Train G. M. Workers

Closest cooperation between the Saginaw Steering Wheel Division of General Motors and the local schools speeded this company's machine gun output

GENERAL MOTORS has developed training practices to meet its own needs. At the Machine Gun Division of AC Spark Plug small groups of foremen and set-up men are trained first, as explained in a previous article (*AM*—Vol. 85, page 1127), and these in turn train additional foremen and set-up men, as well as machine operators. No public education facilities are utilized. All workers receive instruction in the shop after being hired.

The creation of the factory organization for the machine gun plant of the Saginaw Steering Gear Division has been approached somewhat differently because of circumstances peculiar to its situation. Foremen and set-up men for one shift were largely drawn from personnel possessing some experience in gun-making procedure, as obtained from an educational order. Tooling-up for mass production took longer than at AC Spark Plug because: (1) the caliber 0.50 gun to be made at AC Spark Plug had a higher priority rating for equipment, and (2) the caliber 0.30 gun to be made at Saginaw had not been made in production since the World War and had to be tooled up from scratch. Consequently, Saginaw could devote more time to procure and train operators.

Most of the new employees for the Saginaw plant were recruited from unskilled labor, young men from 18–25, living in surrounding communities and adjacent farming areas. No women were employed. While machine operators could not expect to be transferred from machine to machine, in order to attain a semi-skilled status, it was considered desirable to spread as much skill through the organization as time would permit. Some operators showed sufficient skill to be advanced to set-up men: older men with more shop training qualified as set-up men through intensive training.

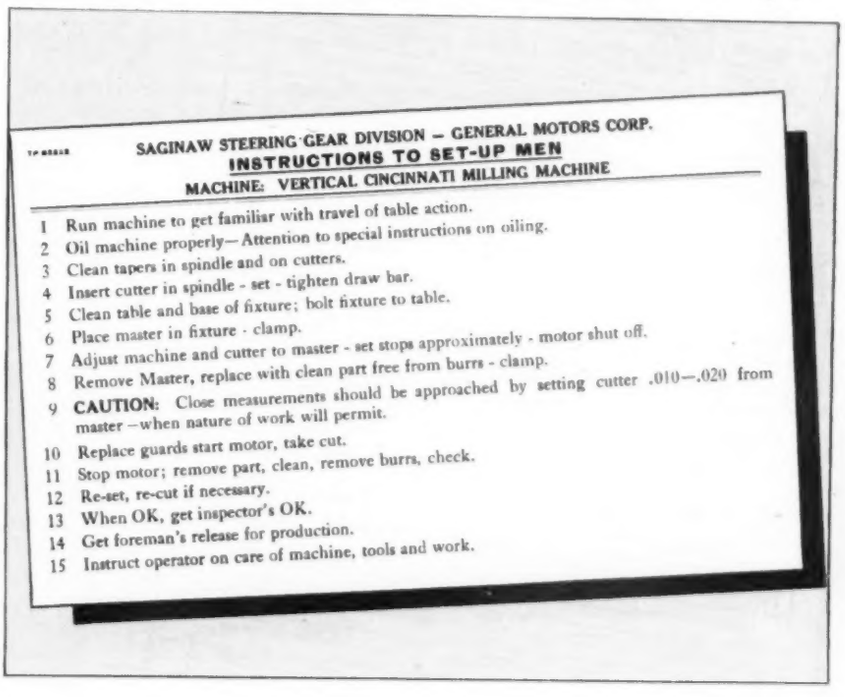
Saginaw's management foresaw, however, that it would be impossible to train thousands of workers by the vestibule system in the time available. Vocational-training has been a strong feature of the Saginaw school system for many years. By arrangement with the school authorities and those in charge of the Federal sponsored training programs, the greater part of the vocational training handled in the school system has been switched to pre-training for defense work in the community, particularly that at the machine gun plant. Fully 50 percent of the employees so far have been obtained from the Arthur Hill Trade School, and this percentage is expected to rise although the hiring rate is increasing.

The success of the pre-training program rests squarely upon the unusual degree of cooperation existing between the Arthur Hill Trade School and the training department of the machine gun plant. Profilers have been loaned to the school, in order to facilitate training of operators for these critical machines in advance of openings in the plant. Lists of anticipated requirements are constantly supplied by the plant. Likely looking boys are referred to the school. The two training supervisors visit the school each day, follow the progress made by the students, give a bit of advice or lend encouragement. Each student is treated as an individual. The training supervisors can call each boy by name, they know enough about him to have a good line on his capabilities and character. Close attention to each student pays dividends in avoiding employment of misfits and undesirables. A friendly spirit is carried into the plant. Boys passing through the pre-training and employment processes encourage others to do likewise.

The training department endeavors to maintain close ties with operators after employment. Boys are encouraged to bring their problems to the training supervisors, to lead a decent life because of the seriousness of defense work and plant morale. Many of the boys must board away from home, and to such a friendly interest is shown concerning living accommodations and participation in community life. Young men from as far away as Boys' Town, Nebraska and Georgia are on the payroll and making good.

That young America is anxious to go to school in the hope of getting a job is fully illustrated by conditions in the Arthur Hill Trade School. Classes

Instructions for set-up men, as compiled for various machines by General Motors Institute, have been adapted by Saginaw Steering Gear Division. An operation sheet is posted on the machine to pictorialize the job for the operator and show fixture-locating points and dimensions to be gaged



SAGINAW STEERING GEAR DIVISION — GENERAL MOTORS CORP.

INSTRUCTIONS TO SET-UP MEN

MACHINE: VERTICAL CINCINNATI MILLING MACHINE

1 Run machine to get familiar with travel of table action.
2 Oil machine properly—Attention to special instructions on oiling.
3 Clean tapers in spindle and on cutters.
4 Insert cutter in spindle - set - tighten draw bar.
5 Clean table and base of fixture; bolt fixture to table.
6 Place master in fixture - clamp.
7 Adjust machine and cutter to master - set stops approximately - motor shut off.
8 Remove Master, replace with clean part free from burrs - clamp.
9 **CAUTION:** Close measurements should be approached by setting cutter .010—.020 from master—when nature of work will permit.
10 Replace guards start motor, take cut.
11 Stop motor; remove part, clean, remove burrs, check.
12 Re-set, re-cut if necessary.
13 When OK, get inspector's OK.
14 Get foreman's release for production.
15 Instruct operator on care of machine, tools and work.

PROGRESS CHECK SHEET & CHART

Name **No.** ✓

1	Explain Defense Programme	
2	Explain General Motors Part especially Saginaw Steering Gear	
3	How is skilled help to be obtained	
4	The man's part, opportunity and conduct	
5	Stress safety, shop rules and time card	
6	Care of machines, tools and gages	
7	Teach him to read micrometers, gages, scale and blue print reading.	
8	Care of finished product. Quality of work.	

Starting date Starting rate Dept.-started in

Transfer date Transfer rate To dept. No.

Rating Date	%	Rating Foreman	Rate Change Date

Machine started on

Other machines operated

Remarks

Approved by Approved by

EMPLOYEE'S RATING CHART

SAGINAW STEERING GEAR DIVISION
GENERAL MOTORS CORPORATION

REASON FOR RATING — MONTHLY 1 2 3 4 5 6 — TRANSFER — LAYOFF

DATE EMPLOYEE'S NAME FIRST MIDDLE LAST CLOCK NO.

JOB NAME RATED FOR PERIOD FROM TO JOB RATED ON NO.

PUT CROSS IN SECTION WHICH MOST ACCURATELY DESCRIBES DETAIL OF THIS EMPLOYEE

QUALITY RATED	DETAILS OF QUALITY	UNSATISFACTORY NEGATIVE QUALITIES		NEUTRAL QUALITIES		SATISFACTORY POSITIVE QUALITIES		DETAIL TOTAL	QUALITY TOTAL
QUALITY OF WORK	ACCURACY OF WORK	MANY ERRORS AND SPOILED WORK 0	CARELESS 3	FEW ERRORS 6	CAREFUL 9	CLEAN AND CAREFUL 12	NOT ACCURATE		
	CARE OF EQUIPMENT AND WORKING SPACE	VERY CAREFUL AND SLOVENLY 0	CARELESS 2	CAREFUL IF WATCHED 3.5	FAIRLY CAREFUL 5	CAREFUL 7	VERY CAREFUL		
	HANDLING OF MATERIAL	ROUGH 0	CARELESS 1.5	FAIRLY CAREFUL 3	CAREFUL 4.5	FAST 6	VERY FAST		
QUANTITY OF WORK	SPEED OF WORKMAN	VERY SLOW 0	SLOW 3	FAIR 6.5	FAST 10	GOOD 13	VERY BUSY		
	USE OF WORKING TIME	VERY WASTEFUL 0	LOAFS 3	WORKS ENOUGH TO GET BY 6	GOOD 9	LEARNS QUICKLY 12	BRILLIANT		
ABILITY TO DO OTHER WORK	ABILITY TO LEARN	DULL 0	LEARNS SLOWLY 1	NORMAL 2	DOESN'T EVADE 3	LIKES IT 4	SEEKS IT AND HANDLES IT WELL		
	ACCEPTANCE OF RESPONSIBILITY	BUCK PASSER 0	EVADES IT 1	DOESN'T SEEK 1.5	SEEKS IT 2	RESOURCEFULLY SUGGESTIVE 3	VERY ORIGINAL		
	INITIATIVE	LIVES IN A RUT 0	SELDOM OFFERS SUGGESTIONS 1	FEW NEW IDEAS 2	DOESN'T HELP 2.5	HELPS 3	EXCELLENT LEADER		
	ABILITY TO DIRECT WORK OF OTHERS	ANTAGONIZES 0	HINDERS 1	DOESN'T HINDER 2	DOESN'T HINDER 3	VERY FEW ABSENCES 4	EXCELLENT		
ATTENDANCE	DAILY ATTENDANCE	ABSENT A LOT 0	ABSENT FAIRLY FREQUENTLY 1	SOME ABSENCES 2	2.5	3.5	5		
	JOB ATTENDANCE	SELDOM WORKS FULL SHIFT 0	QUIT FROM JOB TOO OFTEN LATE OR LEAVES EARLY 1.5	ON JOB ENOUGH TO GET BY 2.5	NEUTRAL	AT JOB WHEN WHISTLE BLOWS, LEAVES PROMPTLY 3.5	MANY DEFINE WORKS IN WHISTLE AND NO. 3.5		
CO-OPERATION	ATTITUDE TOWARDS COMPANY AND SHOP RULES	ACTIVELY ANTAGONISTIC 0	PASSIVELY ANTAGONISTIC 1	NEUTRAL 2	CO-OPERATES PASSIVELY 3	CO-OPERATES ACTIVELY 4			
	ATTITUDE TOWARDS SUPERIORS	DISREGARDS WISHES 0	FOLLOWS ORDERS DISINTERESTEDLY 1	NEUTRAL 1.5	FOLLOWS ORDERS CHEERFULLY 2	TRIES TO HELP MAKE GOOD 3			
	ATTITUDE TOWARDS FELLOW WORKMEN	PUTS BLAME FOR ERRORS ON THEM 0	INCONSIDERATE TOWARDS THEM 1	HELPS THEM WHEN TOLD 1.5	OCCASIONALLY VOLUNTEERS ASSISTANCE 2	EXTREMELY CONSIDERATE 3			
SAFETY HABITS	ATTITUDE TOWARDS SAFETY PROGRAM	OBSTRUCTIVELY CRITICAL 0	FOLLOWS RULES DISINTERESTEDLY 1	NEUTRAL 1.5	OFFERS A FEW SUGGESTIONS 2	EXTREMELY HELPFUL 3			
	OBSERVANCE OF SAFETY RULES	OPENLY DISREGARDS 0	DISREGARDS WHEN NOT CLOSELY WATCHED 1	OBSERVES SOME RULES 1.5	OBSERVES ALL RULES 2	OBSERVES ALL AND HAS OWN 3			
	ACCIDENT RECORD	MAJOR INJURIES INCLUDING CARELESSNESS 0	MANY MINOR INJURIES 1	FEW MINOR INJURIES 2	GOOD RECORD 3	EXCELLENT RECORD 4			
PERSONAL APPEARANCE AND REACTIONS	PHYSICAL CONDITION	VERY POOR 0	MANY MINOR AILMENTS .5	FEW MINOR AILMENTS 1	GOOD 2	VERY GOOD 3			
	GENERAL APPEARANCE	SLOVENLY 0	CARELESS .5	AVERAGE 1	NEAT AND CLEAN ALWAYS 1.5	EXCEPTIONALLY PLEASING 2			
	REPUTATION	KNOWN BAD 0	QUESTIONABLE .5	AVERAGE 1	GOOD 1.5	VERY GOOD 2			

TOTAL NUMERICAL GRADING

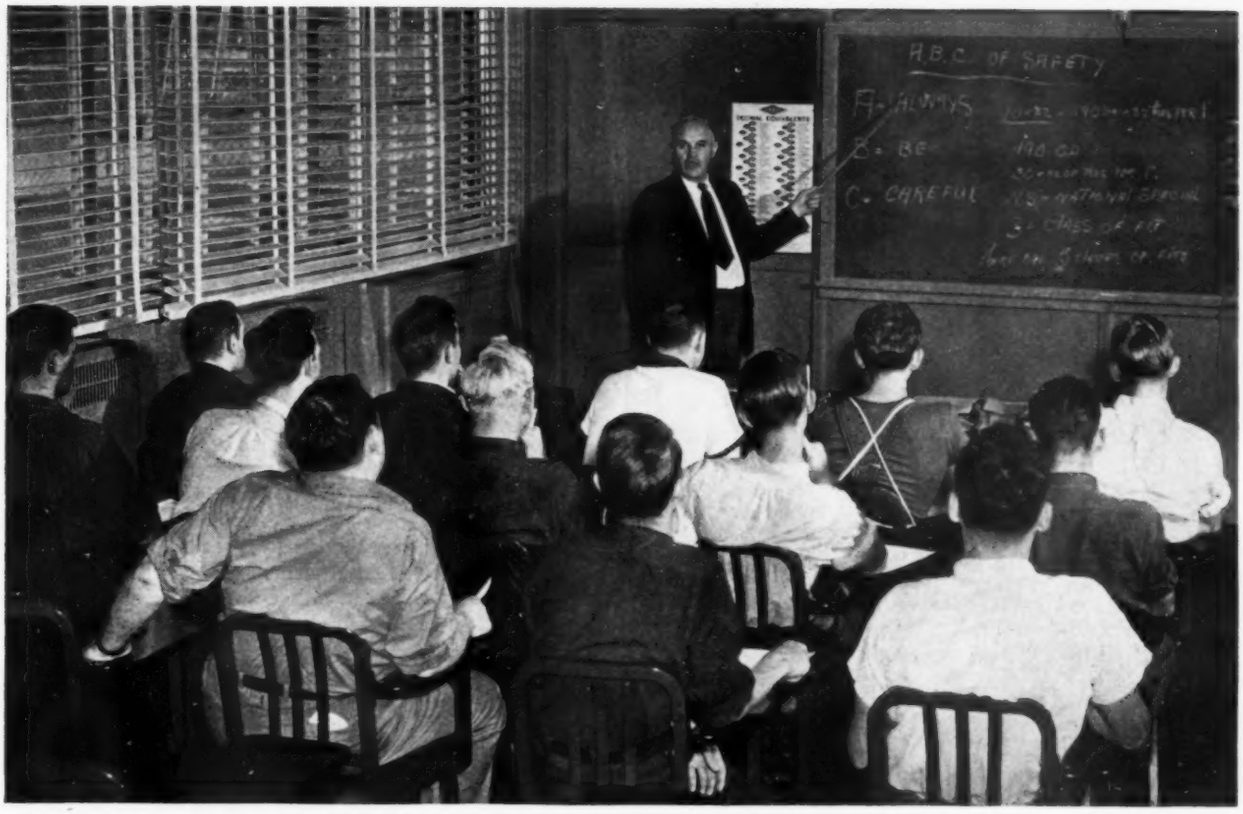
RATED BY (FOREMAN) NUMERICAL GRADING BY

The training department, at Saginaw, is responsible for the new employee until he is accepted as a satisfactory operator by the department foreman. This form is used to keep track of classroom instruction given each boy, the machine and department to which he is assigned, and his progress in the shop

are conducted almost continuously for 24 hours per day, but applications exceed the teaching capacity. Cases could be cited of farm boys getting up in the middle of the night to walk miles to school for instruction from 4 a.m. to 10 a.m. Students may take instruction in operating a machine or two, then leave to take a job, or they can enroll in ten-week courses. Supplementary training in five machine-shop courses is available to employed persons. Operators, set-up men and inspectors from the machine gun plant avail themselves of these opportunities. Pre-employment, or "refresher" courses, for WPA and unemployed high-school graduates are of similar duration. Out of 188 persons enrolled in one recent period, 80 percent got jobs before they completed instruction. NYA training is being expanded, and the better type of boys are encouraged by the school and plant authorities to take this work in anticipation of a job upon completion of the course. Prior to graduation from high-school this spring, 85 youths had signed up for NYA training. Altogether, the school has an enrollment of over 1,000 persons at any one time, and with addition of more instructors it will be in a position to supply more than 50 percent of the 4,000 people that the machine gun plant must have on the payroll by February.

While at least half of the new employees receive some rudimentary training by the trade school, the training department is responsible for them until they are accepted as satisfactory operators by their foremen. New employees without proper background must receive streamlined training concerning plant rules, safety, care of machinery and gages, simple mathematics and blueprint reading in order to lighten the load of the foremen who actually do the job training. The ground is covered in seven sessions of 1 to 2 hours per day. Boys with trade-school training are required to attend

Defense won't tolerate fooling with dullards or slackers. This employee's rating chart is filled out by the foreman for each learner at definite intervals. If the boy's ability and character are found wanting in two to three months, he is dropped



Job training at Saginaw is undertaken by foremen. To lighten their load, the training department gives seven lectures to new employees without pre-training in the trade school

only the first session which covers the induction of the new employee.

The material covered in these seven training sessions has been outlined in great detail by the training department, but from long repetition the two instructors cover the ground without notes. They must constantly maintain unflagging attention because there is no time to repeat the material at a later date. The chief difficulty experienced by the instructors (and they have spent many years in apprentice training and handling labor) is to speak in the simplest terms, make their points, and do so without giving the appearance of "talking down" to their audience. Some of their hearers have not progressed beyond the sixth grade, they know nothing of shop work, blueprint reading, the use of the micrometer. To maintain interest and be sure the class is getting something from the instruction, questions are frequently invited.

First Training Session

The training department sees that all new employees receive the induction, or first lecture, on the first day of employment. Day-shift employees start their factory experience with this session, in groups of 20 to 25. Night-shift employees receive it before going home. The session is divided into the following five parts:

Part I, 25–30 min.—Greet each employee by name and shake hands. Explain importance of national-defense program. Discuss General Motors' part in defense program, as related to the machine-gun contract. Tell what General Motors is—a corporation owned by stockholders. Show that the company executives are interested in the employee's welfare. Explain what the new employee's job will be—running a new machine vital to the defense production, and that he is not there to learn a trade.

Part II, 10–15 min.—The most important subject is safety, followed by first aid, care of time cards, conduct, attention to instructions in class and from the foreman. Emphasis is laid upon the defense angle once more, particularly avoidance of loafing and wool gathering. The employee rating chart is explained. A recess follows.

Part III, 20 min.—Classes have been split up into groups of seven or eight. Review of simple mathematics—decimals and fractions. Use of the scale. Explain the micrometer and its value. Teach how to read, use and care for the micrometer. In three minutes boys are taught how to use the micrometer, believe it or not! Older men with some shop experience and trade-school boys among the new employees assist the instructors in showing novices how to hold and read the instrument.

Part IV, 15 min.—Explain the workers badge, which shows his number and photograph. Present him with locker keys. Once more drive home that he is engaged in a big defense job and the motto is "Work. There is no time to waste."

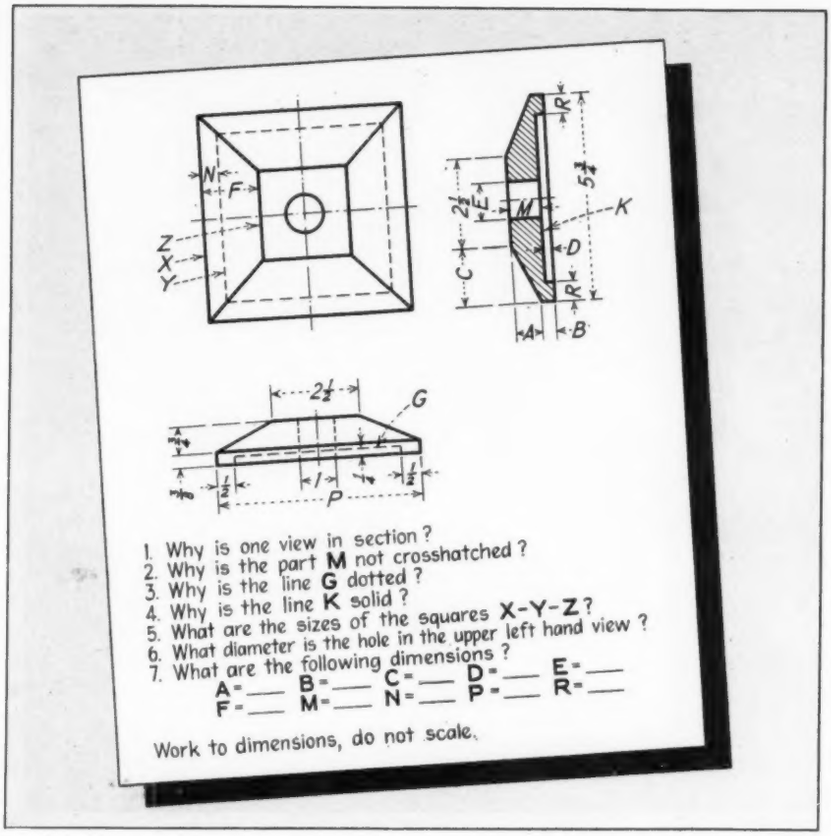
Part V, 20 min.—Take the boys into the shop. Show them the location of the time clock and how to ring it. Locate their lockers. Take boys to assigned departments to start work if at the beginning of a shift or, if at the end of the shift return them to their departments in time to clean machines before going home.

Second Training Session

Instruction is given in care of machinery, care of gages and how to use gages. This instruction is given with seven or eight boys gathered around the instructor, so that each can see and handle gages under his direct supervision. This session takes up 2 hours.

Third to Seventh Sessions

One hour is given per day in elementary blueprint reading. Five blueprints have been made up by the Gen-



General Motors Institute prepared five blueprint-reading exercises, each of which requires one hour of classroom instruction

eral Motors Institute to show simple objects such as a gland, a truncated pyramid, a bracket, a flanged pipe and a drill press table. Two views are given of the part, and frequently a section. Students are not taught the principles of third-angle projection, except by indirection, since that subject would be over their heads. Wooden models are manipulated by the instructor to illustrate the various views of the part as shown on the blueprints. Even with sectioned models it is difficult to convey the meaning of sections. Blueprints have questions which must be answered—such as dimensions, why lines are solid or dotted, etc.

Inspectors are given more extensive instruction in blueprint reading and they are encouraged to take supplementary training at the trade school.

Learner Follow-Up

Although actual job training must be done by the foreman, the learner remains under the jurisdiction of the training department during his probationary period. It is distinctly up to the learner to sell himself to the foreman and achieve an operator's status as fast as possible. Trainees start at 50 cents per hour, are raised five cents at the end of four weeks, and an additional five cents at the end of the next eight weeks. The operator's rate is 75 cents an hour. What the management wants is an operator as fast as possible, and it willingly pays the rate as soon as the new employee qualifies. The foreman also wishes the learner to make the grade without delay, to lighten his training load, but he is responsible for production efficiency and cannot upgrade the novice too soon. Therefore, it has been established that the probationary period shall not exceed three months. In fact, unless there are sound reasons for continuing the boy in probationary status for more than two months, he may be discharged. Hence the ascending pay scale for probationers is not of much importance.

The length of time during which boys require on-the-job training varies widely. One boy made the grade in a week. Many have taken only ten to fifteen days. The great majority need less than two months training to become operators. Some of the keener-minded and better-trained boys have advanced from operators to job-setters and even foremen. Youths who have taken supplementary training in the Arthur Hill Trade School are usually first in line for promotion. Thus, a definite incentive is available to those who will spend leisure hours in self-improvement. In the long run the machine gun plant will provide thousands of young men with some degree of shop training, where no opportunity existed before, and for many the ground work will be laid for future employment and success.

To maintain a check on the status of each boy, the Training Department employs two records: (1) the progress check sheet and chart and (2) the employees rating chart, both of which are shown here. Foremen are asked to fill out a rating chart for new men at the end of the first two weeks employment, so that the management can immediately get a line on the ability of the learner. Further rating charts are requested at four-week intervals, unless the trainee achieves operator status in the meantime.

The progress check sheet has spaces for checking the lectures given the learner by the Training Department, his department, the periodic ratings made by his foreman, current rate of pay, the machines he has run or is operating, and remarks concerning his attitude and progress. Training supervisors keep a close watch on these charts, investigate boys who are lagging.

The employees rating chart permits the foreman to rate the learner as unsatisfactory, neutral or "so-so," and satisfactory in respect to seven qualifications: (1) quality of work, (2) quantity of work, (3) ability to do other work, (4) attendance, (5) cooperation, (6) safety habits and (7) personal habits and characteristics. These seven main qualifications are broken down into two, three, or four sub-headings. These sub-headings are checked at the proper point according to the foreman's interpretation of performance by the trainee. Arbitrary values are assigned to the degree of satisfaction rendered for each qualification. The total of points checked equals the trainees rating. A perfect score equals 100. Boys with 50 or less are on dangerous ground. The periodic ratings are entered upon the employee's progress chart, and if he does not improve to a rating of 70 or 80 within several weeks, he is subject to dismissal. The rating chart is not binding, because the general behavior and personal characteristics of the boy are taken into account. Foremen must steer a careful course in using these rating charts. Harsh rating decimates the training group; over-leniency in accepting operators impairs departmental efficiency. Once the foreman accepts an operator, the Training Department's jurisdiction over the employee ceases.

Machine Tool Electrical Standards—III

STANDARDS governing electric motor and control equipment for machine tools were adopted by the National Machine Tool Builders' Association on September 5, 1941. The first part of these standards, giving data on wiring diagrams and symbols, has already been published (*AM*—Vol. 85, pages 1283 and 1285), excepting standard wiring diagram symbols for control devices, knife switches and circuit breakers, and alternating- and direct-current motors and generators which are shown in this issue.

Control

200. Control shall meet the standards of the American Standards Association C19, as revised from time to time, and the National Electrical Manufacturers Association Industrial Control Standards 40–59.

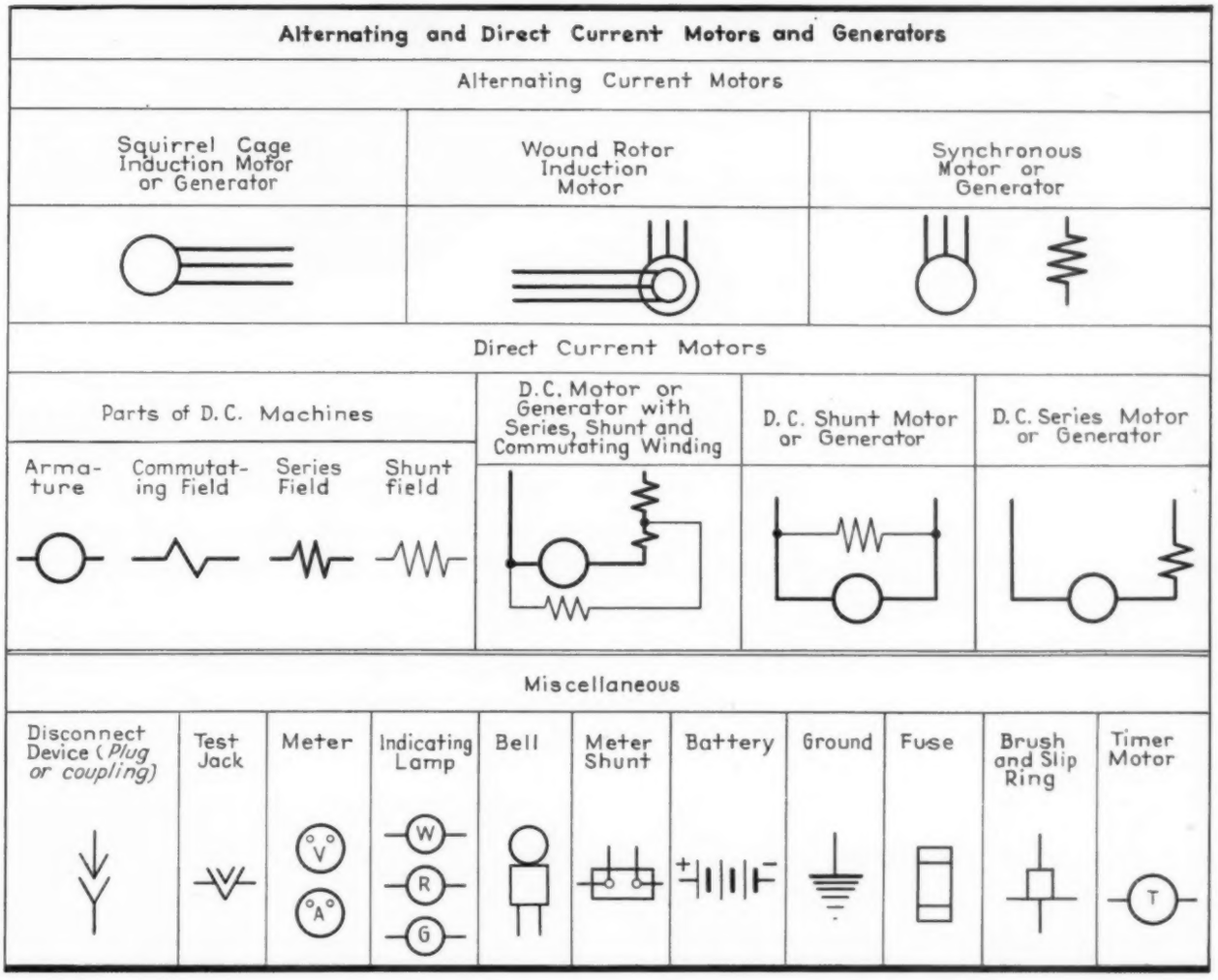
Opening of Circuits

201. The machine-tool builder shall not be required to furnish a disconnect switch, but it is recommended that the user apply one that will manually disconnect all lines of all circuits to the machine at one point.

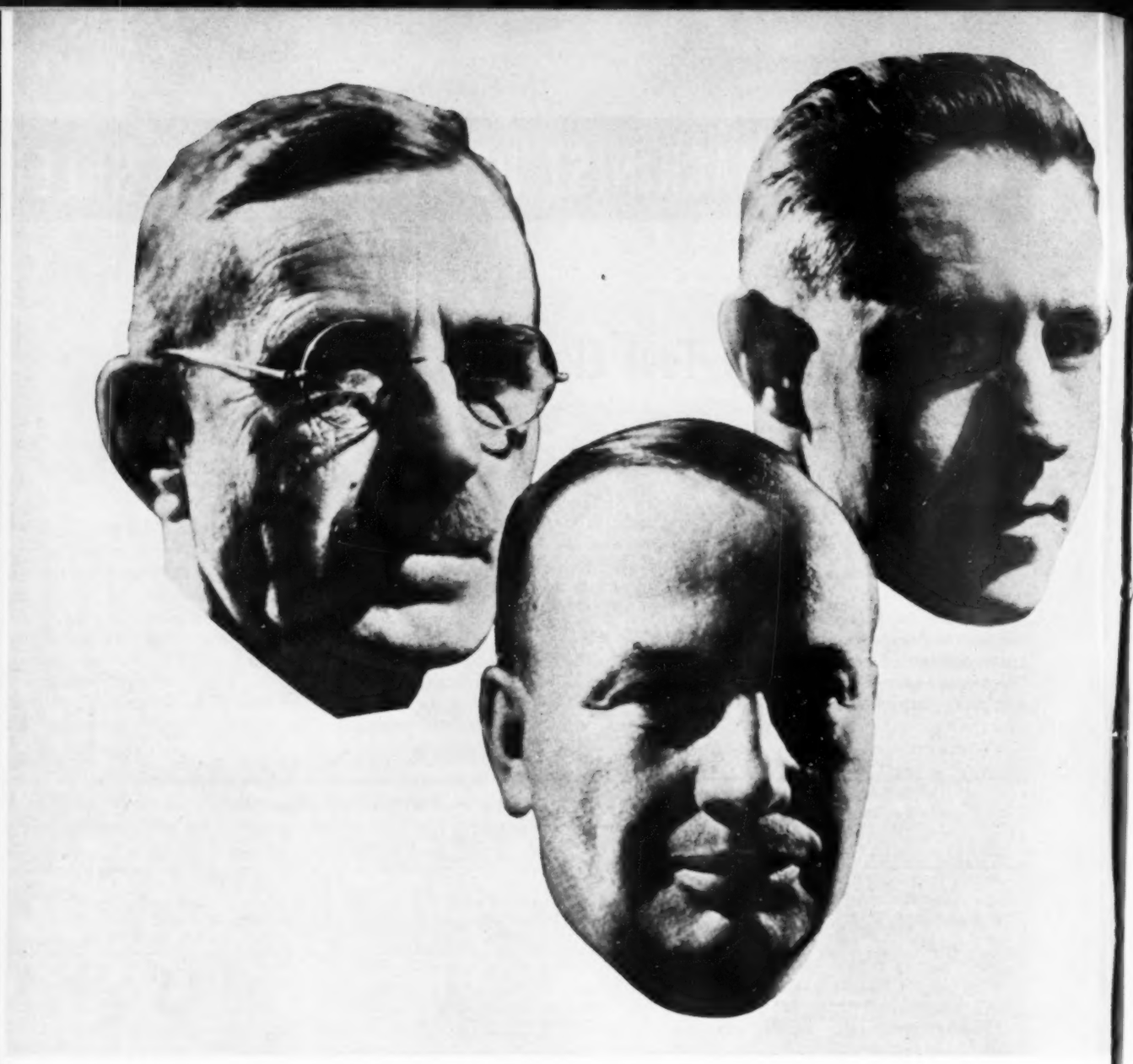
Protection

203. Control shall provide overload protection for each motor, excepting that if fractional horsepower or short-time rated motors are not provided with overload protection they shall be used only on branch circuits which are provided with suitable fuse protection.

204. Under-voltage protection shall be provided for all motors which might cause damage to the machine or injury



STARRETT TOOLS



To the Men behind the Men behind the guns.

The L. S. Starrett Company takes this opportunity to pay tribute to the thousands of skilled craftsmen whose ability and energy have made America what it is today . . . and whose loyalty and integrity are helping to keep it that way.

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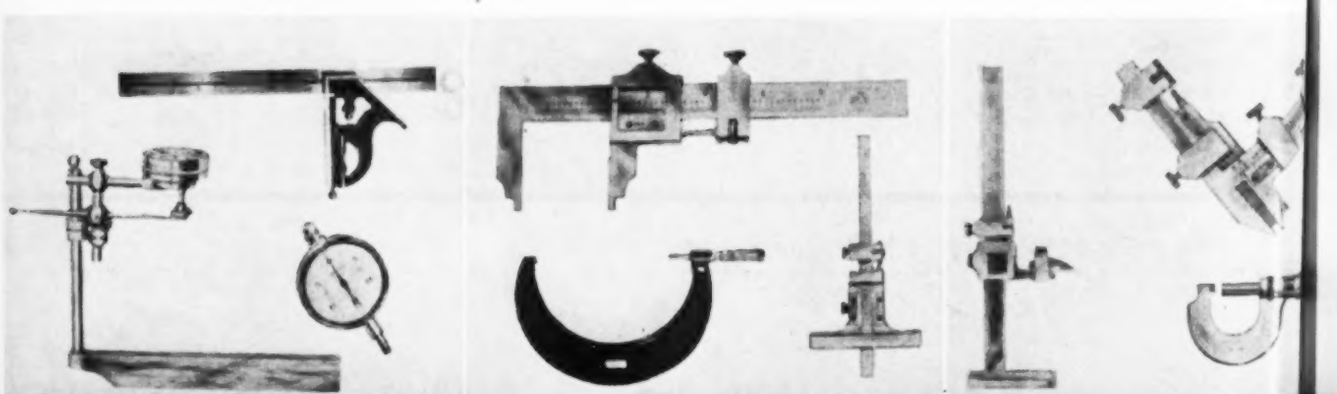


Machine Tool Electrical Standards—IV

to the operator should they start after interruption and return of power.

205. If the failure of one or more motors to operate can cause damage to the operator, machine, or work in process, protection shall be arranged so that all motors that could cause this damage are shut down due to the tripping of any overload or undervoltage device protecting these motors.

206. Separate disconnects and fuses for motor circuits are not required.

Circuit Testing

207. Wiring shall be so arranged that circuits may be checked at accessible locations, usually the control panel.

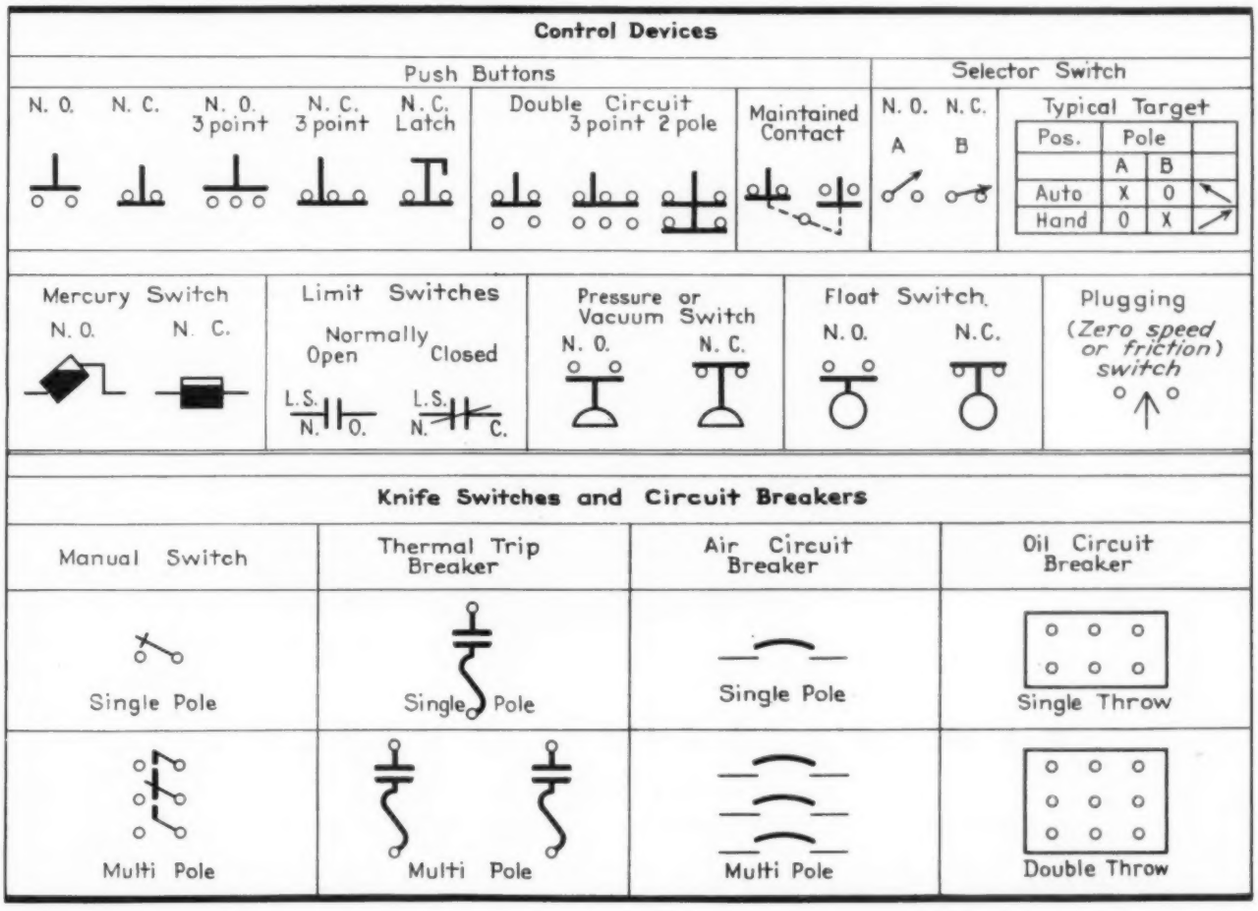
208. Where A.C. low voltage control circuits are required, the control voltage shall be 110 volts obtained from a transformer with an isolated secondary winding, and the control circuit shall be protected by fuses or equivalent overload devices placed in the transformer circuit, preferably in the secondary. (See also 412 and 413).

209. Where line voltage is used for control circuits, if control runs are not over 25 ft. long, and the control wires have a current carrying capacity of at lease one-third that of the conductor from which they are supplied, or if the branch circuit protective device is rated at not more than five times the current carrying capacity of the control wires, control fuses need not be furnished.

Inclosure

210. Control shall be inclosed and shall be mounted in such a manner as to guard it against oil, coolant, dirt, and dust. If the control is mounted in the base or column of the machine it shall not be considered inclosed if the space in which it is mounted is open to the floor or foundation upon which the machine rests. If operating conditions are excessively dirty, semi-dust tight inclosures (NEMA type 1A or equal) shall be used except for compartments requiring ventilation.

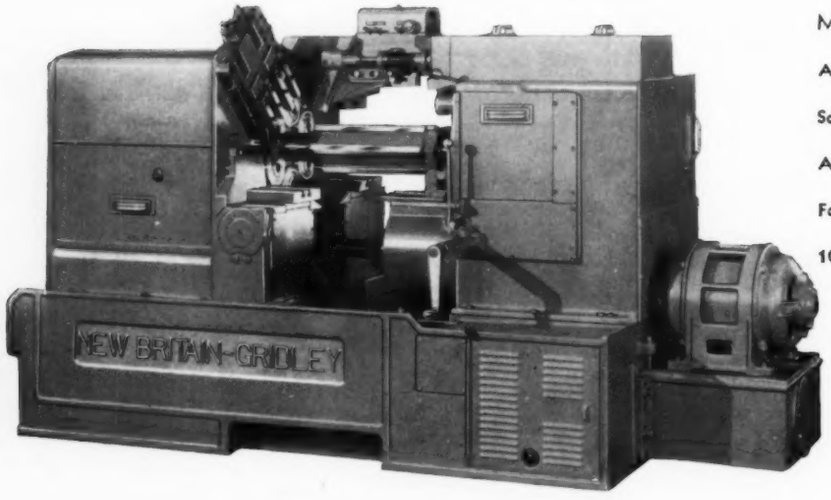
Further data on this standard will appear in an early number



IN STEP . . .

Today our armed forces are wholeheartedly serving their country. In step with these men —in step with the times—we, too, wholeheartedly serve the cause of National Defense.

ON WITH THE JOB



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A complete line of Multiple Spindle Screw Machines up to 2¼" Capacity. Also a complete line of Chuckers; Four, Six and Eight Spindles up to 10¼" Capacity.

NEW BRITAIN - GRIDLEY

MACHINE DIVISION

THE NEW BRITAIN MACHINE COMPANY NEW BRITAIN, CONNECTICUT

Looking Toward Victory

LIFE FOR ALL AMERICANS has been different since the Pearl Harbor tragedy. For the last two weeks we have been fully conscious of the grim job cut out for us.

To come out second in war is unthinkable. You are either the victor or the vanquished. There is no half-way place. That's why we can't afford to fool in this struggle.

Our foes are ruthless. They have a head start. But let's not lose sight of the fact that we have on our side some great and precious assets—the mightiest industrial resources, the most skilled management and the most mechanically minded people in the world. On top of that, Americans have a will to fight like tigers when they must fight. They never know defeat.

The big job ahead is to throw all these assets into the Battle of Production. For this war is a Battle of Production. Odds are that the side which outproduces its foes will come out on top.

The myth of German invincibility has been built on the premise of crushing superiority in tanks, planes, guns and other weapons of war. The Russians now are in the process of destroying that myth. It will be completely wiped out when the full force of American mass production is felt.

That brings us to the solemn and patriotic responsibility that now rests upon the metal-working industry.

Every manufacturer must put to work on war goods every suitable machine tool in his plant. There are 168 machine-hours in each week. He should not be satisfied until his machines are crowding that maximum figure.

There is no such thing today as being ahead of schedule. We need every bit of war material so desperately that if a manufacturer thinks he is ahead of schedule, he should redouble instead of relax his efforts and come that much closer to helping Uncle Sam win a speedy victory.

If a metal-working manufacturer has no war contracts, he should seek them without further delay. The country must have the assistance of every industrialist. He should not expect Uncle Sam to search him out and dump an order in his lap. He should go to Uncle Sam. After all, Uncle Sam is a very busy man these days.

Then let's make sure of one other thing. We must retain that resourcefulness and ingenuity which have long stamped American industry as the best in the world. Even more in wartime than in peacetime, let's not be afraid to try new ideas, new techniques of getting what we must have as quickly as humanly possible. Being hidebound never got anyone anywhere, including Uncle Sam. Being daring has won many a war.

Like it or not, we are plunged into a death struggle between two kinds of worlds—ours and the totalitarian. The sooner we get down to earth and use every ounce of ability and energy we possess, the sooner the war will be won.

Time is precious, especially in this Second World War. Let's not waste it, for no synthetic substitute for it has yet been discovered. It is up to American industry to put everything it has into the Battle of Production and make every minute count.

That is the first and foremost essential of a program looking toward victory.

Burnham Finney

GAGING BUSINESS

Machine tool production likely to total $1,300,000,000 in 1942. Pool-order plan expanding. Russia asks $35,000,000 in machines. Munitions program grows. Navy commissions 27 combat ships

To meet the war demand the machine tool industry will produce half again as many machine tools during 1942 as in the last twelve months. Output next year should reach $1,300,000,000, or almost thirteen times the volume in an average pre-war year. A meeting last week between the Office of Production Management and the makers of so-called critical machine tools will result in further enlargement of machine tool operations to take care of emergency needs. Various means of expansion will be used—further additions to plant facilities in some cases, more subcontracting in others, more men on second and third shifts. Another factor already is having a favorable effect in increasing output: The desire on the part of the workers to beat the Japs. That is being reflected in getting more production in the same length of time.

Machine Tools—One of the difficulties in the machine tool industry today is the unbalance in operations among individual manufacturers. Orders are not spread out evenly throughout the industry. At least sixty builders can take business for delivery within six weeks. They make machines for which the demand for war manufacture is not so heavy. By contrast the makers of critical machines are jammed to capacity much farther ahead. The industry as a whole has a backlog of close to $600,000,000. In November, production totaled $74,600,000. The unparalleled expansion of machine tool production in such a short time has resulted in a severe strain on the financial resources of many companies which at present are running a business three or four times bigger than two or three years ago. To aid their working capital the Government has agreed to a down payment of 30 percent when war orders are placed.

To enable machine tool builders to operate on "all-out" schedules without worrying about being short of orders a few weeks or months hence, Washington is arranging for substantial expansion of so-called pool orders. The pool-order plan permits machine tool companies to produce large quantities of machines of one size without knowing at the time where they will be used. A number of machine tool builders are putting tools for the "E" bomber program in warehouses because subcontractors on heavy bomber work have not yet asked for them. Many machines which will not be needed immediately for bomber manufacture are being diverted to other war factories. Scores of machine tools built under Lend-Lease are reported waiting on shipping floors of machine tool builders because Washington has not supplied shipping instructions. In certain cases machine tool companies are having production troubles because important subcontractors have secured prime contracts from the Army and Navy and new subcontracting sources must be found. The industry is not experiencing any serious difficulties in obtaining materials, though the ball bearing supply has caused anxiety on the part of some builders.

Russia has definitely asked for almost $35,000,000 of machine tools and has had around $15,000,000 worth allocated to her. She would like to get all of these machines within nine months, but the pressure of America's own war effort will make it impossible to deliver the entire lot within any such period. In fact, the acceleration of the war program here at home makes it necessary to divert to U. S. plants many machines originally destined for Canadian shops. That is a temporary situation which will be rectified later. Other countries, including India, are attempting to secure machine tools to enlarge their armament productive capacity.

Munitions—The greatest push at the moment is on manufacture of anti-aircraft guns. Equipment for such plants is being given priority over everything else. By January 1 tank output will be 840 units a month, or 30 percent of the 2,800 a month projected by the end of 1942. Six plants, including one Canadian factory, are building medium tanks of the M-3 type. Five armored divisions and tank battalions of the U. S. Army have been outfitted, plus a considerable number of tanks going to the British in North Africa. Production of mortars has reached the stage where all U. S. troops have been equipped with them. New huge munitions programs are in the making. The Government is determined, however, to avoid erection of further new plants except where it is absolutely necessary. It feels that existing facilities first should be utilized, particularly factories which have been forced to abandon production of civilian goods. It will take time to get much of the new program into the contracting stage. Companies hoping to secure subcontracts should not be disappointed if many of them cannot obtain war work in the next thirty to sixty days.

Shipbuilding—In the period from January 1 to November 30 of this year the U. S. Navy commissioned 27 combat ships, launched 41 and laid keels of 128. Of those commissioned, two were battleships, one an aircraft carrier, fourteen were destroyers and ten were submarines. The Navy today can build big ships in two years instead of three, and lighter ships in one year instead of a year and a half. Final runs of the Navy's 1,500-ton cargo ship of the Sea Otter type have been made, following changes in machinery installations.

Aircraft—Over 2,000 planes a month are now rolling off the assembly lines of 26 plants in the United States. The full gains made are not entirely reflected in the increased number of units produced. The fact is that more and more of the planes turned out are of the medium and heavy bombing types, which means more manufacturing hours per plane. Brewster Aeronautical Corporation will be in mass production of dive bombers within six weeks at its new Johnsville, Pa., plant. The first Army bomber assembled from parts fabricated by the automobile industry will be produced in a new $11,000,000-plant at Kansas City, Missouri, shortly after the first of the year, several months ahead of schedule. This plant will make the B-25 two-engine bomber and will be managed by North American Aviation. Sub-assemblies will be made in the Fisher Body factories at Detroit and Memphis, Tenn.

Steel—At the Government's request the steel industry is to proceed right away with plans for increasing ingot capacity eight to ten million tons a year and finished steel capacity two to three million tons. The program should be completed early in 1943. An acute shortage of scrap still exists. With practical suspension of automobile production, except for trucks and military vehicles, the space occupied on mill schedules by automotive tonnage has been taken by armament orders of high rating. Increased tonnage of heavy sheets and plates will now come from strip mills.

Railroad Equipment—Makers of locomotives, car builders and railroad appliance companies will get considerably more steel as a result of an agreement reached with OPM on December 12. They have been badly handicapped in keeping up with their orders because steel plates have not been allocated to them in sufficient quantities. Total bookings for rail equipment this year will be around $200,000,000. Over 107,000 tons of steel plate were allotted car builders for December, compared with 94,000 tons during November and 100,000 tons in October.

Farm Equipment—A plan is being worked out in Washington whereby farm implement companies will be guaranteed enough raw materials in 1942 to produce a respectable volume of goods. The program seems likely to assure the industry 80 percent of the materials consumed in 1940.

OPM PLANS ALLOCATION OF ALL MACHINE TOOLS

Seizure law amendment would allow agency to make full use of equipment, scarce materials

WASHINGTON—Planned allocation of existing machine tools is in the offing. For nearly a year the priority system has operated to put newly-manufactured tools in the plants where OPM thought they'd do the most good. Now getting the finishing touches is a scheme to take tools from plants that aren't getting full use out of them and put them where they can contribute to increased arms output.

It's a job that the Office of Production Management has been anxious to tackle for some time. Until war was declared it wasn't politically feasible, but ran afoul of nice but slow-starting schemes for taking the job to the machine through sub-contracting and facility-pooling. War makes it possible to be more hard-boiled.

One Legal Obstacle

There's still a legal obstacle. Requisitioning of tools is to be carried out under a law passed last October. It permits the President to seize any tools or materials needed for the production of munitions.

However, a still-cautious Congress wrote into the law a clause forbidding seizure of any tool essential to the conduct of a business. OPM lawyers think that this debars requisitioning of any tool which is being used so much as a couple of hours a week.

An amendment striking out this limitation will be before Congress soon and with war pressure behind it will doubtless skitter through. As soon as the bars are down, OPM expects to go after a lot of tools of critical types that are now being worked three or four hours a day. Fair compensation will be set by the government.

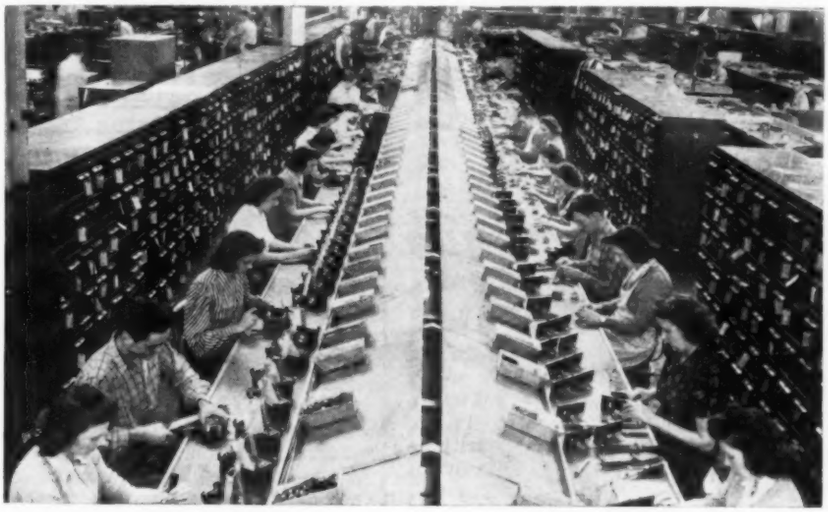
Knows Where Tools Are

OPM knows where the tools are. Its tool section for several months has been making a census of critical tools. It went into the records of the tool manufacturers for years back and traced their deliveries and the present location of the tools. The census is now complete and includes data on the present usage of the tools.

Even without the amendment, the law is available to drag excess stocks of raw material into the war economy. The way the requisitioning power will be used is suggested by the fact that it has been assigned to a new Inventory and Requisitioning unit in the Priorities Division of OPM. Months ago, OPM ordered producers to keep their inventories at minimum possible levels, but this has been little more than a pious hope. A few flagrant violators have had deliveries withheld from them until their inventories got down to size. The requisitioning law puts teeth into inventory control.

Surveys Nearly Completed

OPM now has a pretty fair idea of where the worst inventory situations are. When the Supply, Priorities and Allocations Board was created one of its first moves was to order a survey of inventories. The commodity branches of OPM have been working on these surveys through questionnaires and some of them are nearing completion. Moreover, the detailed applications required under the Production Requirements Plan are expected to provide a further fund of inventory data.



For Total Offense—*By January Rochester Products Division, General Motors, will have made a complete changeover from automobile to war production. Conveyor line above, formerly producing automobile horns, has been converted to making control units for aircraft and tanks*

Brainard Named Chief Of Tool Section

WASHINGTON—George Brainard, president of the General Fireproofing Co., Youngstown, Ohio, has been appointed chief of the Tools Section of the Office of Production Management. He succeeds Mason Britton, vice-chairman of the McGraw-Hill Publishing Co. Mr. Brainard, a graduate of Cornell University, is chairman of the Board of the Federal Reserve Bank of Cleveland and is a former coordinator of the defense contract service of OPM for the Cleveland district.

Labor Voice in Management Coming; Legislation Halted

WASHINGTON—Organized labor, just before Jap bombs started dropping on Pearl Harbor, was in its weakest strategic position in years. The House had passed the drastic Smith Bill, forbidding jurisdictional or organizational strikes and picketing by anyone except striking employees, requiring registration of unions and a 60-day cooling off period before strikes and establishing a statutory mediation board. It was assumed that the bill would be modified by the Senate, but even administration spokesmen admitted that some of its provisions would become law.

Came the war, and the whole picture was reversed. There was a wave of no-strike declarations by unions. All but the die-hards swung to the view that willing commitment by labor to continuous production is now essential. When the President called the industry-labor conference, he effectually put a halt to Congressional action—a halt that's likely to last a good while unless the conference flops completely.

Labor Participation in Management

More than this, there are indications of a new upsurge of labor political strength. Labor is going to make important concessions in FDR's conference, and the quid pro quo is likely to be an increased participation by labor in the technical-managerial phase of the war industries. This has been a CIO objective ever since President Murray brought out his scheme for management of defense by labor-management-government "industry councils." Strong groups in the administration have been eager for months to attack the war-labor issue by giving the unions political concessions in return for their waiving their economic weapons.

Most striking indication that such a deal is in the making is Sidney Hillman's frank promotion of the CIO

Army Millinery—*New helmets which will be worn by U. S. soldiers protect back of neck and side of head. They replace the flat, less safe tin hat of World War I. Worker at McCord Radiator Co. welds chin strap loop*

plan for increased copper output. This plan, like the Reuther and steel plans, is one facet of the Murray plan. Taking a suggestion from the CIO proposals, Hillman called a labor-management conference to work out schemes for greater production, continuous mine operation, reopening of low-cost properties and assembling an adequate labor force.

In other industries, shipping for instance, studies are being made of the best way to meet labor shortages. Faced by the possibility that this industry-by-industry approach may break down, administration leaders are beginning to think in terms of a possible need for priorities in labor. British experience along this line is being studied, and the U. S. Employment Service, which would probably have the handling of the job if it had to be done is preparing its organization to meet the load.

KEARNEYS SELL INTEREST

MILWAUKEE — Full family control of Kearney & Trecker Corporation, manufacturers of milling machines, will end soon. Since the founding in 1898 all interests in the firm have been owned by the families of the two founders—Edward J. Kearney and Theodore Trecker. Since the death of Mr. Kearney in 1934, Mr. Trecker and his four sons have carried on the management of the company. Mrs. Kearney and daughter plan to dispose of their interest, about one-half of the outstanding stock.

House Eliminates Battleships From Naval Appropriation Bill

WASHINGTON—With the U.S. engaged in a two-ocean naval war, Congress last week passed a bill authorizing 150,000 tons of navy fighting ships. The bill did not specify what types of ships should be built, but Carl Vinson, Naval Affairs Committee chairman, said the tonnage will be used in aircraft carriers, cruisers, destroyers and submarines.

Mr. Vinson insisted that the omission of any battleships from the program had nothing to do with the Pearl Harbor fiasco, but other competent authorities said that the loss of one United States and two British battleships, apparently all by airplane attack, had made a profound impression on strategists everywhere. The controversy over the vulnerability of heavy ships to airplane attack apparently has been settled. Six or eight other battleships have been put out of business or sunk by aircraft during this war. What the admirals will do about it remains to be seen.

Use All Shipyard Space

All available shipyard space will be occupied during 1942 with the additional Navy program, Mr. Vinson said. Asked if this meant any encroachment on merchant shipbuilding, the Maritime Commission stated that the occupation of ways is mutually agreed upon by the Commission and the Navy.

The Navy has placed orders for 5,334 vessels, costing $7,351,497,905 since January 1, 1940. This includes all types of boats.

Pool Motor Firms' Facilities For More Tanks—Reuther

NEW YORK—Proposing that General Motors, Ford and Chrysler pool their tank construction facilities, Walter P. Reuther, author of the "Reuther plan," for the mass production of war planes in idle automobile factories, outlined last week a plan for speeding the building of 30-ton tanks by the Detroit auto industry. Instead of each company carrying on operations on its own, Mr. Reuther would have them use a single set of tools and dies.

"In that way," he declared, "we can tool up for production in half the time now estimated for the tooling period, and once we are in production we can turn out three times as many tanks as are contemplated under present schedules." He made a more general plea that all in the war-production program pool and coordinate their effort.

Industry Protests

The automobile industry has steadfastly protested that only part of the equipment in auto plants can be converted to the production of war weapons (*A.M.*—Vol. 85, page 1286g). Alex Taub, recently appointed head of the conversion section, Contract Distribution Division of the Office of Production Management, has claimed that 50 to 70 percent of auto plant equipment can be utilized. Reuther charged that automobile manufacturers frowned on his original plan for mass producing airplanes in auto plants because they feared it would interfere with normal peace-time business.

He pointed out that production of tank transmission at the Mack Truck plant in New Brunswick was halted due to lack of gear-cutting machines. He pointed out that many machines like those needed were standing idle in Detroit. Stating that 150,000 skilled workers in Michigan would be idle by Jan. 1, and that this figure would be doubled by February 1, he laid the blame at the feet of the industry for failure to convert plants to war work.

WORK MORE, PRODUCE MORE

MILWAUKEE—"Our duty, now, as we see it, is to double, triple and quadruple our effort," stated a handbill given to workers the day after war was declared by Benjamin Franklin, president, Employees Independent Union at Kearney & Trecker Corp. "All machines must be kept running at full speed," Mr. Franklin wrote, "No time must be wasted talking or gossiping—every minute now is important.

Where 12 and 15 hours work have been turned out, he warned, 20 and 25 hours must be turned out. He finally informed the workers that the Union had been assured by the company that no rates would be cut.

Hurry Expansion of Steel; Aim at Pig Iron Increase

WASHINGTON—Steel-making facilities, particularly in fields most vital to war production, are being hurriedly expanded under a series of A-1 priority ratings just authorized by the Office of Production Management. Two immediate aims are: (1) increase in pig iron production capacity and (2) the increase of electric furnace and other finishing facilities to offset expected shortages in iron and steel scrap.

About 7,000,000 ingot tons of the 10,000,000-ton expansion of annual capacity recently authorized, have been approved. OPM sources could not say how much of the 7,000,000 tons has been actually started because, they said, iron and steel plants are "built backwards"—that is, equipment is assembled first and the last thing is a building to house it. Much of the equipment is in process of manufacture.

Other speed-up steps are being taken. One of them under consideration is to equip a number of existing blast furnaces with air-conditioning units, which can be installed in four or five months without delaying operations. These units, it is estimated, would increase pig iron output by 5 to 8 percent or 1 to 2½ million tons a year.

SET STEEL GOODS PRICES

WASHINGTON—All retail or "warehouse" sales of iron and steel products—mainly nails, pipe, wire, tubing—are placed under ceiling prices prevailing April 16, 1941. This new schedule, Office of Price Administration order No. 49, uses the same ceiling date as the original iron and steel price order No. 6.

OPA Administrator Henderson said the new schedule is to "end the profiteering" which has developed in certain quarters of the steel distribution trade. Steel interests in Washington told AMERICAN MACHINIST that most jobbers, dealers, and distributors had maintained right prices, but that they had been harried by a minority of profiteers, and that they welcome OPA's action.

About 85 percent of all iron and steel is sold by steel mills directly to consuming industries. The remaining 15 percent, however, includes iron and steel pipe and tube of which 54 percent is resold; wire and wire products, 40½ percent resold; galvanized sheets, 46 percent resold; plus important quantities of tool and alloy steels.

CDD PLACES WAR EXHIBITS

WASHINGTON—Permanent exhibits of equipment and parts needed for war are being opened by the Contract Distribution Division to aid plants seeking war work. First exhibits will be in New York, Chicago, St. Louis, Philadelphia, Cleveland and Detroit. Soon after Jan. 1 others will be placed in Atlanta, Boston, Cincinnati, New Orleans, Pittsburgh, Seattle, Birmingham, Buffalo, Kansas City and Los Angeles.

War 'Against Axis' Bars Halt to Lend-Lease; November Aid Amounted to $140,000,000

WASHINGTON—To the average man, this country is at war with Japan. To the President, we are fighting "A group of axis powers led by Nazi Germany." This is why no slackening in the Lend-Lease effort is to be expected even though we are at war. There may be some temporary reductions in deliveries over the next month or two—in airplanes while we replace initial Eastern losses, more seriously in anti-aircraft needed to build up our almost non-existent stocks.

Meanwhile, Lend-Lease shipments are beginning to represent a substantial part of our deliveries abroad. In November we shipped some $420,000,000 worth of goods to the British Empire and Egypt, of which about $140,000,000 was paid for from Lend-Lease funds. The remainder was shipped on British contracts made prior to passage of the Lease-Lend law.

All Aid Totaled $283,000,000

For the present, Lend-Lease shipments represent a net increase in exports. Last March, deliveries on British contracts amounted to $240,000,000 a little less than in November. Soon they will begin to taper off, while Lend-Lease deliveries will rise rapidly.

The $140,000,000 of actual shipments is not the full amount of Lend-Lease aid, which totaled $283,000,000. The difference consists of goods not yet shipped plus such items as production facilities in this country, repairs to foreign ships, and the like.

Lend-Lease shipments to Russia began in November. Our agreement with the U.S.S.R. provides for a billion dollars of Lend-Lease aid by June, 1942. At present deliveries are somewhat behind schedule, but this appears to be due to transportation difficulties rather than production.

MORE COOPERATION ON PRICES

WASHINGTON—A price fixing law will be passed soon, but the need for a drastic law has been restricted by the impact of war which stimulated a will to cooperate by most sections of the U. S. Supported by the War spirit, Leon Henderson's price control, furthermore, is reaching out farther and stronger and in more directions.

Henderson still wants a drastic law. He wants particularly the licensing provision under which any seller who goes above the price ceiling will lose his right to sell. But licensing may not be granted because of the changed attitude brought about by the war.

The House emasculated the Administration's price control bill, but the Senate is about to create a new one in committee. Although the metal-working industry will be interested, it won't be greatly affected by it. For, the war agencies have all materials tied up solid against price manipulation.

British Combine

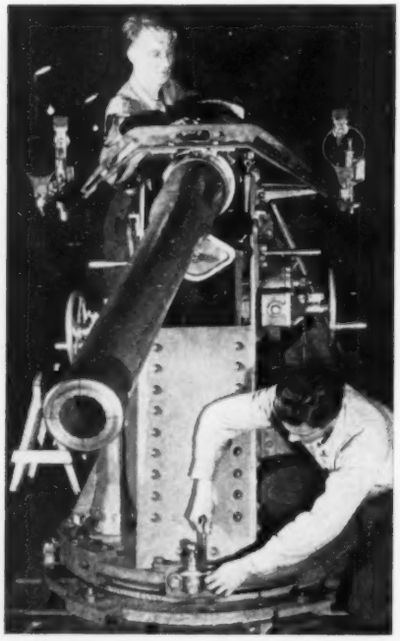
Davy Jones' Helpers—*These large naval shell being gaged in a British factory will be used to sink Axis ships. Holes near nose of each shell accommodate lifting devices for easy handling in factory or aboard ship*

Use Less Vital Material In Alloys, OPM Recommends

NEW YORK—Use of less vital material in metal alloys than heretofore is stressed by Col. George S. Brady, chief, Substitution Division, Civilian Allocation Division of the Office of Production Management, in a study prepared for the National Association of Purchasing Agents. Rocan copper, a sheet with low electrical conductivity, but with great endurance, was recommended for structural uses by Colonel Brady. A high strength, low alloy steel (Otiscoloy), developed to save strategic and scarce alloying elements, has high yield strength, is easily machined, and has two to three times the corrosion resistance of copper bearing steels.

Cut Aluminum Content

Among the other alloy substitutions recommended by Colonel Brady were a zinc base die-casting alloy containing 1.5 to 2 percent aluminum, replacing an alloy which contained 4 percent of aluminum; mica for aluminum in paint; sheet lead alloy for copper, brass or bronze in flashings. Tensile strength of the die-casting alloy is reduced about 10 percent by the cut in aluminum content, but greater conductivity and higher impact strength are obtained after aging. Addition of 75 percent mica powder for aluminum provides a protective paint film. Elimination of creep in the sheet lead alloy has alleviated the usual objection to use sheet lead in building construction.



Sub Gun—*In a Canadian plant final touches are made on a Navy 12-pounder. Now being produced in large quantities, this gun is effective against submarines*

With U. S. at War Canada Speeds War Plans; Mitchell, Another Bevin, Gets Labor Post

OTTAWA—Since Japan's attack on the United States the Mackenzie King government has been mapping and putting into operation an all-round expansion of the Canadian war program. Many Canadians have complained for two years that their government was not whole-heartedly in the war beside Britain against Germany. The speed with which the King administration declared war with Japan and started national machinery in motion to contribute to victory satisfies public opinion in this country that there is no further holding back.

Speedup and enlargement of the Canadian program start with reorganization of the government itself, call for mobilization of all men and women both for the combatant services and for war production, and involve as large an extension in the output of war supplies as the availability of raw materials permits. One big step, assuring no interruption of war production by labor trouble, was the shift of Labor Minister Norman McLarty to another cabinet post and his replacement by the Bevin of Canadian labor—hard-headed Humphrey Mitchell.

Opposed Radicalism

As head of several labor and wage boards during the war period Mitchell has earned the confidence of both industrialists and workers. His appointment is regarded as a guarantee that politics will cease to be a factor labor policy, that strikes in essential industries will not be tolerated. Always identified with organized labor, he is strongly opposed to radicalism. Employers and union organizers know that the country's war job now will have right of way over any class interests.

Other impending cabinet changes are designed to provide strong national unity leadership for an over-all system of selective national war service. The administration has authority to enforce it under the National Mobilization Act of June, 1940. The only limitation is that manpower cannot be drafted for service outside Canada. This is likely to be removed with the need for large reinforcements to the volunteer army overseas. Machinery is being organized for calling up of man and woman power on a selective draft basis.

Will Recruit Women

About 575,000 Canadians, 75,000 of them women, are now engaged in war industry. An additional 100,000 will be needed during the first two months of 1942. It is proposed to recruit women for half these jobs, fill the other half by transfers from civil industry. The labor shortage will be increased further by combing war plants for men for the fighting forces. As these are drafted out of factories, men and women will be drafted in from other work. A division of the Labor Department was assigned to make a survey which will serve as a basis for transfer.

Canada's expansion program makes no general provision for new plants or plant enlargements. Reason is that under the vigorous direction of Subcontracting Coordinator J. F. Jeckell the farm-out system inaugurated in October is rapidly expanding production. Officials claim the farm-out practice in Canada is now on a par with the system in the U. S., although little was done to encourage it before early autumn.

Jeckell Must Approve

Two rulings of the Department of Munitions and Supply direct that contracts and appropriations for capital expenditure must pass through Jeckell's hands to make sure that no new plant is authorized for production that can be farmed out, and contracts must be split into bits and pieces as far as possible by the department itself instead of being given in bulk to large contractors as formerly.

Further drastic curtailment of civilian production is a major part of the war plan. Freezing new tires supplies (except those on new cars) fits in with a proposal for total ban on private passenger automobile manufacture. In September output was cut to 42,000. A 50 percent cut was ordered in output of light trucks. Production of radios, already under a 25 percent curtailment, is now dropped to 50 percent of last year.

With the U. S. preparing to carry the major load in cleaning up the Pacific, the lease-lend system will operate on a two-way basis between Britain and the U. S., with Canada in between. Ottawa is prepared to back Churchill's suggestion that the output of Canadian plants under contract to Britain be transferred to the U. S. if the need of American fighting forces is greater.

NOVEMBER GEAR SALES OFF

WILKINSBURG—November industrial gear sales were 39 percent above those of the same month of 1940, but were 8.3 per cent below October. For the eleven month period ending November, this years sales ran 81.6 percent higher than in 1940. The report made by the American Gear Manufacturers Association put the November index figure at 241, lowest monthly volume this year, but substantially above any month of 1940. In June and July gear sales were at their highest—the index reached 299 and 298 respectively.

INSIDE DETROIT

Auto industry thrust into "distressed" class by war dictated slash in civilian production. Some "clean up" manufacture will use up inventory materials. Parts makers seek munitions contract as group

BY RUPERT LEGRAND, DETROIT EDITOR

DETROIT—War dictated slashes in original quotas for passenger car production in December and January are thrusting a large sector of the automobile industry into the "distressed industry" category. There is no kicking about virtual suspension of passenger-car production after Jan. 31, because everyone knows that materials, especially rubber, are needed for war material. As soon as the ban on sale of new tires and tubes went into effect, car factories started shipping cars without a spare tire, dealers were instructed to remove spares from vehicles in stock.

There will be some "clean-up" manufacturing after Jan. 31. The industry normally buys parts and materials from 30 to 60 days ahead of final assembly. Since the Office of Production Management has in effect ordered that the theoretical quota of 153,636 cars shall not be produced, an undetermined amount of material for these cars has reached the state where it cannot be converted to defense purposes, without extreme loss.

Inventories Taken

Therefore, an inventory will be taken of goods in process and transit so as to form a basis for establishing the clean-up procedure. Government officials and automotive advisors will have data upon which to solve a knotty problem. The brightwork ban was extended twice to prevent economic waste, and the same reasoning will doubtless apply to the wind-up manufacture of finished cars for civilian purposes. Wherever possible, fabricated materials and parts will be diverted to replacement stocks. After cleaning up civilian production, car and light truck output will be for military and public-protection purposes only.

Manufacture of replacement parts for passenger cars and light trucks is not likely to be curtailed further in the near future. But manufacturing volume in many parts plants will dwindle sharply. This situation may eventually bring about the concentration, under government auspices, of parts production in a few hands, leaving other concerns free to engage completely in munitions work for which their facilities can be adapted.

Need More War Contracts

The auto industry has only $3,000,000,000 worth of defense contracts, of which a good percentage has been delivered. Prime contracts are centered in automobile companies and the larger parts makers. To overcome the full loss occasioned by suspension of civilian car production, prime contractors need several times as much defense business. Defense work has been widely sub-contracted but the tendency will be to protect home plants unless a vast flood of new war contracts is released. Therefore, the future is dark for the hundreds of small parts manufacturers who do not possess the facilities to undertake a prime contract.

98 Firms Surveyed Equipment

Relief for metal-working firms in the parts industry may spring from the efforts of the Metal Working Manufacturers Committee to obtain certification as a "distressed industry group in a small area." The program to date represents the composite ideas of government officials and parts manufacturers for developing a plan to obtain a prime contract for manufacturers by the pooled resources of member plants. If successful, the plan may be a pattern for other metal-working groups.

The Committee evolved from the efforts of Frank Rising, general manager of the Automotive Parts & Equipment Manufacturers Association to find defense work which could be produced by the pooling of plant resources. Ninety-eight firms from all over the United States furnished equipment schedules to the APEM. Production engineers representing the group learned in Washington that the government was chiefly interested in machinery and toolroom facilities readily convertible to munitions manufacture, and that it prefers to assist distressed firms on a local basis. Only exception to that policy is the award of a gun-carriage contract to the washing machine industry.

Form Two Groups

With this experience the Committee organized on the following basis: Group 1, 22 parts firms within a radius of 50 miles from Detroit, and Group 2, 22 associate member firms in Toledo, Rockford, Columbus, Chicago, Flint, Saginaw and other communities. The first group is composed of plants, which joined upon a voluntary basis, and was limited to 25 concerns at the suggestion of government. The associate members will form nuclii for other "distressed industry groups." A. T. McHenry, president of Bowen Products Co., is chairman of the executive committee. Active members of Group No. 1 include both large and small manufacturers.

First Product—*A. C. Carlson, vice president, and E. W. Brehm, president, of the Bremacc Corp., Detroit, look over the first down cut milling machine produced by the company. Carlson designed the miller. Since its founding in July, company has built and equipped a plant, set up production schedules*

Survey Labor, Equipment

A survey of labor distress will be made by the Michigan Unemployment Commission, while the Committee is analyzing available equipment. Both will be turned over to the local OPM office and reviewed by the Area Labor Supply Committee. A final report will be made to the Contract Distribution Division of OPM in Washington. Such reports are necessary to receive consideration at the capital. Certification hangs in doubt, however, because the entire auto industry rather than a group of parts plants may receive prime attention as a "distressed industry."

Third Party Banned

Encouragement for success of the program is seen from recent government approval of exemptions from the provisions of Section 1 (a) of the Walsh-Healey Act, which now permit "Defense Production Associations" to receive contracts (*Federal Register*, Dec. 9, 1941). The CDD is now permitted "to certify as defense production associations, groups of manufacturers who collectively have facilities which may be used to manufacture defense articles, who have agreed among themselves for the use of their facilities for such manufacture and who are found to be appropriate in character." By character is meant: a committee not organized by third parties with an agreement to pay a percentage.

Agency Lacking to Protect War Plants; FBI Offers Aid

WASHINGTON — Declared war has faced industry with the question of what to do about protecting its plant against enemy action: sabotage and air raids. Today there is no clear answer and no agency prepared to take command of the situation, to decide what measures are needed or how great the danger is.

Army and Navy are thrashing out the problem of establishing, in each department at least, a central agency to handle protection of their suppliers' plants against air attack. Each of the two under-secretaries now has a plant security section, but these groups have confined themselves in the main to policy-setting on sabotage matters, with the Federal Bureau of Investigation doing the bulk of the work even on this.

Troops at Plane Plants

Meanwhile, protective measures are being taken, partly on the plants' own initiative, partly under control of the local commanding officers. Aircraft plants—as logical first targets of attack—moved especially rapidly. Squadrons of troops were thrown around nearly all the major plants. On the West Coast, anti-aircraft guns were concentrated at plane factories, and at some the Air Corps stationed interceptor planes.

Civilian plants seeking help have no place to go in Washington except the Office of Civilian Defense. OCD is telling businessmen that plant protection is up to them and to their local authorities; OCD has neither authority nor funds to tell them what to do, but all firms that ask are being advised to make themselves independent of outside fire protection and to take ordinary precautions against sabotage. This last means principally control of admittance by use of guards, fencing, and a system of employee passes; in some cases it calls for control of movement within the plant.

FBI Offers Help

Ever since the outbreak of war in Europe, the FBI has been offering a consulting service on sabotage prevention to plants that requested it. Since December 7 this service has been greatly stepped up.

Plants near either of the coast lines—within, say, 300 miles—or located in major industrial centers, are being advised to prepare for air raids. It is suggested that men be assigned to specialized squads (fire, police, health, and maintenance) under a plant defense coordinator to deal with bomb damage. Duplication of plant services like electricity, gas, rail sidings, etc., is recommended. Simple camouflage measures are being suggested to plants in the critical areas—dulling brightly painted tanks and stacks, darkening areas of white concrete.

OCD, Army, and Navy have agreed on a policy that industrial plants should cooperate in test blackouts until they have satisfied the competent authorities that they are capable of blacking out quickly and effectively. Defense plants should in no case carry participation to the point of interfering with production.

If any firm, despite all precautions, does see its plant blasted by bombs, it will have the protection of an "insurance" scheme set up by the Reconstruction Finance Corp. The War Insurance Corp. will reimburse owners of physical property (not including money, papers, and art work) destroyed by enemy action. Though already in effect, the scheme is still tentative and subject to change. For the present no premiums are to be collected, and the property-owners need do nothing about the matter except report actual losses when they are incurred.

DEFENSE ORDERS IN BRIEF

COPPER—Manufacturers of copper articles will be permitted to use inventories of partially fabricated metal until March 31. Under an amendment to Conservation Order M-9-c manufacturers had to file Form PD-189 before last Saturday.

IRIDIUM—Conservation Order M-49 prohibits use of iridium and its alloys in the manufacture of jewelry. Purpose is to conserve the metal for military use.

MACHINE SHOPS, FOUNDRIES—Preference Rating Order P-56 has been amended to grant an A3 rating for the acquisition of repair, maintenance or operating supplies by small machine shops and foundries when needed to fill orders received from mines.

PASSENGER CARS, LIGHT TRUCKS—Production quotas of passenger cars and light trucks have been cut 25 percent for December and 50 percent for January.

JUKE BOXES—Limitation Order L-21 requires a 25 percent cut in output of automatic phonograph, weighing and amusement machines during December and subsequent curtailment of 50 percent beginning Jan. 1 and of 75 percent beginning Feb. 1. Large quantities of steel and other critical or scarce materials will be saved.

RAILROAD RAIL—Price Schedule 46 fixes prices for relaying rail (still serviceable) originating from Class 1 railroads at $28 per gross ton, and of relaying rail from all other sources at $30 per ton.

REFRIGERATORS—Supplementary Limitation Order L-5-a increased the curtailment of production of domestic mechanical refrigerators to from 30 to 52 percent during January and February. Original order called for reduction of from 29 to 45 percent.

STOVES, RANGES—Production of stoves, ranges and other cooking appliances will be curtailed on an average of 35 percent from Jan. 1 to Apr. 30. Cut will range from 30 to 42 percent depending on sales volume of the company. Savings of about 58,000 tons of iron and steel will result during the first quarter.

TRUCK TRAILERS—All restrictions on production of truck trailers, as outlined in Limitation Order L-1-a have been removed.

VACUUM CLEANERS—Limitation Order L-18 imposes a 10 percent cut in production of vacuum cleaners for household use.

HALF-TRACK VEHICLES—Preference Rating Order P-35 grants assistance of an A-1-f preference rating to manufacturers turning out armored half-track vehicles for the Army and for the British Government.

WASHING MACHINES, IRONERS—Supplementary Limitation Order L-6-a imposes cuts ranging from 5 to 40 percent in the production of domestic washing machines and ironers.

WELDING ELECTRODES—Preference rating order P-85, granted a preference rating of A-1-c to orders for materials entering into the production of resistance welding electrodes. Producers must file Form PD-82 with the Priorities Division. Monthly reports of applications of the order are required on Form PD-81 or Form PD-81-a.

WATCHING WASHINGTON

War speeds naval program without cut in land-war production. Lend-Lease will continue. Immediate controls imposed on civil life. Want 168-hour work-week. Materials saved for munitions

BY BLAINE STUBBLEFIELD

WASHINGTON—When the shooting war started, it made big differences to industry, but not as big as you might expect. America's war is a naval war, but this doesn't mean that our land-war production program will change direction. There will be minor changes—an increase in patrol bomber schedules, for instance—but we'll go right on building tanks and field guns and such even though these can't be used against the Japs. Even the new fleet authorization (see p. 1342d) are relatively insignificant.

To the administration, Hitler is still the main enemy and the Russian front, for the moment, the main front. The President is probably grateful that the Nazis choose to drive this point home in the public mind by declaring war on us. Lease-lend will go on and, except for a slacking off for a month or so while our initial losses are replaced, will go on at least the same levels (see page 1342e).

Brings Immediate Controls

We'll keep on making the same sort of things we've been making.

But we will make more and faster. Bold expansions, drastic controls, rigid restrictions on civil life that we would have come to gradually over six months or so will be imposed suddenly. Within a day after the war declaration, the Victory Program was official. This scheme to step up war expenditures from a present billion dollars and a half a month and a scheduled three-billion peak to a rate of about five billion late next year had been little more than a gleam in the eye of Nelson, Henderson, Lubin, and a few others of the dynamic group. It had encountered considerable apathy in the services and in many of the Office of Production Management.

In the main, the Victory Program is still a dollar program; it hasn't been pinned down to so many ships, so many planes, so many guns. But the job of writing the specifications has started.

The immense victory program schedules are for production eight to twelve months from now, when new plants can be brought in. But there are things that can be done right away to step up the output from existing plant. They can be done because in the face of shooting war the public now will stand for things it wouldn't allow in November.

Push Full Seven-Day Operation

Backbone of this effort is the push for three-shift seven-day operation. War industry in the main has been on something less than a full two-shift basis. Administration people have raged over this but have rarely been able to dent the feeling on the part of many procurement officers and industrialists that, if a plant is working hard enough to meet its schedules, that's hard enough. The new theme is: If you can meet schedules on one shift, work three and double the schedule.

Sheer publicity is counted on in part to accomplish this. It's unpatriotic now for the plant parking lot to be empty at any time. Leaders of critical industries—planes, anti-aircraft, copper-production, machine tools, etc.—are being called to Washington to work out the needed planning.

But no-one thinks that the 168-hour week can be achieved by fiat. Many, even though not all, of the unused shifts result from labor shortages, material shortages, bottlenecks in the supplying industries. Steps are being taken to ease the pinch in labor supply (see p. 1342h); we may come to priorities in labor.

Keep Minimum Inventories!

A new weapon to attack the materials problem fell into OPM's lap this month when machinery was set up to requisition excess inventories (see p. 1342c). Donald Nelson sent out an appeal to manufacturers that they patriotically release their inventories above a bare minimum into trade channels—and reminded them in the next breath that if they didn't he could make them.

Material saving was the prime motive in a series of drastic cuts in civilian production. Outstanding was the auto cut. Production for December and January was cut in half by reducing the already curtailed quotas by 25 and 50 percent respectively. February quotas were revoked, and there are hints of a flat prohibition of manufacture in that month.

Refrigerators Cut

Refrigerator production cuts for the first quarter of 1942 were almost twice the cuts now imposed, and the axe may swing again. Cuts range from 30 percent for $1,000,000 a year firms to 42 percent for firms over $3,000,000. Even more drastic was the action on rubber. Processing of rubber, except for a few items and sale of new tires except for new cars was temporarily forbidden; for next year a rationing plan limiting civilian tire use to essential needs is being worked out.

Freeze Material Stocks

The rubber order was necessitated not so much by scarcity as by the war threat of scarcity. Similarly, OPM froze existing stocks of tin, prepared to ban use of tin cans for anything except food. Like action is expected on such eastern products as chromite, manganese, tungsten, graphite, mica, manila fiber. All of these are likely to be tight

Big Boy I—*The U. S. Army recently accepted this 60-ton heavy tank built by the Baldwin Locomotive Works. In a two-hour demonstration the new M-1 revealed exceptional destructive power with surprising maneuverability. Hull and turret are heavy cast steel armor. Turret revolves full 360 deg., carries 75 mm., 50 mm. and 37 mm. guns*

for the duration, but controls may soften up a little if the Navy is able to keep open the communication lines to the Indies.

New Plant Expansions Coming

The next month or two will see the beginning of a new wave of plant expansions—aimed to provide in late 1942 and in 1943 the huge arms output that is relied on to lick the axis. Details of these plants are still hazy. When they are decided on, censorship requirements may prevent emergence of any clear picture.

Tank production plans are already on a Victory Program basis. As reported in recent issues of AMERICAN MACHINIST, the original schedules have been nearly tripled by doubling the Chrysler tank arsenal and arranging for new Ford and G.M. arsenals. Late next year, output should go well above 3,000 a month.

Victory schedules have not yet been fully drawn up in aircraft. Preliminary objectives are two. By getting plants now nearing completion more quickly into full production, it is hoped to move the July, 1943 peak (4,000 planes a month, with 500 of them heavy bombers) forward into 1942.

And a new peak is being set. It is intended to achieve, sometime in 1943, a capacity of a thousand heavy bombers a month. This will mean at least six or eight whole new plants.

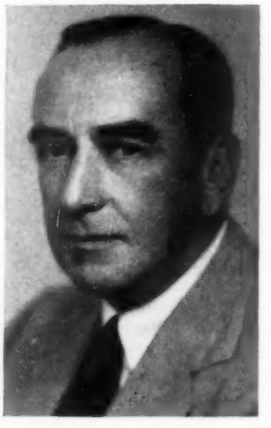
U. S. Government Contracts Awarded to Metal-Working Firms

(Does not include contracts under $300,000)

Source	Agency	Commodity	Amount
General Motors Corp., Lansing, Mich	War	Ammunition	$3,105,000
Crucible Steel Co., Harrison, N. J	"	"	3,144,582
Motor Wheel Corp., Lansing, Mich	"	"	1,505,000
Auto Ordnance Corp., Bridgeport, Conn	"	Magazines	532,646
Wheland Co., Chattanooga, Tenn	"	Guns	9,067,270
Mergenthaler Linotype Co., Brooklyn, N. Y	"	Range quadrants	1,030,128
Mergenthaler Linotype Co., Brooklyn, N. Y	"	Telescopes	3,397,034
Mergenthaler Linotype Co., Brooklyn, N. Y	"	Telescope mounts	857,619
Autocar Co., Ardmore, Pa	"	Track parts	989,400
Eaton Mfg. Co., Cleveland, Ohio	"	Ammunition	2,355,000
Armstrong Cork Co., Lancaster, Pa	"	Shell	782,467
Easy Washing Machine Co., Syracuse, N. Y	"	Fuzes	750,000
Appliance Mfg. Co., Alliance, Ohio	"	Tripod mounts	323,380
Lovell Mfg. Co., Erie, Pa	"	Tripod mounts	409,630
International Nickel Co., Inc., Huntington, W. Va	"	Cylinders	319,485
Bendix-Aviation Corp., Elmira, N. Y	"	Ammunition	312,000
Yellow Truck & Coach Mfg. Co., Pontiac, Mich	"	Trucks	6,717,424
Independent Engineering Co., O'Fallon, Ill	"	Generators	585,000
RCA Mfg. Co., Inc., Camden, N. J	"	Radio equipment	947,389
Coleman Lamp & Stove Co., Wichita, Kans	"	Ammunition chests	411,804
Apex Electrical Mfg. Co., Cleveland, O	"	Machine gun mounts	3,000,640
High Standard Mfg. Co., New Haven, Conn	"	Guns	10,254,557
Nash Kelvinator Corp., Detroit, Mich	"	Binoculars	599,535
General Motors Corp., Saginaw, Mich	"	Ammunition	6,780,000
The Heil Co., Milwaukee, Wis	"	Servicing trucks	2,620,584
Antonelli Fireworks Co., Rochester, N. Y	"	Ammunition	1,005,000
Mack Mfg. Corp., Plainfield, N. J	"	Truck parts	359,049
Biederman Motors Corp., Cincinnati, O	"	Truck tractors	1,996,860
R. Hoe & Co., Inc., New York, N. Y	"	Recoil mechanisms	1,900,876
Otis Elevator Co., New York, N. Y	"	Gun mechanisms	1,930,400
Ward La France Truck Corp., Elmira, N. Y	"	Trucks	827,049
Columbus Auto Parts Co., Columbus, Ohio	"	Forgings	1,317,500
National Pneumatic Co., Rahway, N. J	"	Ammunition	4,977,264
Duff-Norton Mfg. Co., Pittsburgh, Pa	"	Forgings	509,145
The Heil Co., Milwaukee, Wis	"	Trailers	10,109,640
Standard Steel Works, Kansas City, Mo	"	Semi-tank trailers	9,441,490
Blackhawk Mfg. Co., Milwaukee, Wis	"	Jacks	1,344,306
General Motors Corp., New York, N. Y	"	Hardware	450,129
The Aro Equipment Corp., Bryan, Ohio	"	Propeller hubs	442,017
The Yale & Towne Mfg. Co., Stamford, Conn	"	Pumps, motors	487,734
Watson-Stillman Co., Roselle, N. J	"	Presses, fixtures	293,737
Buffalo Foundry & Machine Co., Buffalo, N. Y	"	Kettles, drives	437,229
Johnson Metal Products Co., Erie, Pa	"	Ammunition chests	452,960
Budd Wheel Co., Detroit, Mich	"	Ammunition	378,000
Budd Wheel Co., Detroit, Mich	"	"	315,000
Chase Brass & Copper Co., Waterbury, Conn	"	Time train rings	354,000
Plomb Tool Co., Los Angeles, Calif	"	Wrenches	594,370
Aviation Mfg. Corp., Williamsport, Pa	"	Engine parts	974,397
Bendix Radio Div., Towson, Md	"	Radio parts	695,302
American Brake Shoe & Foundry Co., Chicago, Ill	"	Forgings	575,360
Denison Engineering Co., Columbus, Ohio	"	Presses	1,221,304
Logansport Machine Co., Inc., Logansport, Ind	"	Hydraulic presses	579,875
Grapho Products Inc., Indianapolis, Ind	"	Ammunition	947,200
Butler Mfg. Co., Kansas City, Mo	"	Portable hangars	445,320
George W. Borg Corp., Chicago, Ill	"	Time fuzes	6,430,000
Pullman Standard Car Mfg. Co., Pittsburgh, Pa	"	Shell	4,650,000
Taylor-Wharton Iron & Steel Co., Easton, Pa	"	Cylinders	1,493,457
American Armament Corp., New York, N. Y	"	Ammunition	420,000
Snap-on Tools Corp., Kenosha, Wis	"	Tools	342,660
U S L Battery Corp., Niagara Falls, N. Y	"	Projectiles	920,000
S. Morgan Smith Co., York, Pa	Int	Turbines	875,915
The Osgood Co., Marion, Ohio	War	Shovels	1,110,459
International Machine Tool Corp., Indianapolis, Ind	"	Machine tools	398,168
Logansport Machine Co., Inc., Logansport, Ind	"	Fixtures	579,875
The Denison Engineering Co., Columbus, Ohio	"	Presses	1,221,304
Fairchild Engine & Airplane Corp., Hagerstown, Md	"	Airplanes	4,329,908
Curtiss-Wright Corp., Buffalo, N. Y	"	"	107,434,037
The Crosley Corp., Cincinnati, Ohio	"	Gun mounts	396,600
The Emerson Electric Mfg. Co., St. Louis, Mo	"	Gun turrets	18,895,625
Boeing Airplane Co., Wichita, Kan	"	Airplanes	3,250,848
International Harvester Co., Washington, D. C	"	Trucks	751,814
McEvoy Co., Houston, Tex	"	Tripod mounts	376,485
Firestone Steel Products Division, Akron, Ohio	"	Oxygen cylinders	830,729
Harrisburg Steel Corp., Harrisburg, Pa	"	Gas cylinders	2,951,980
Sharpsville Steel Fabricators, Inc., Sharpsville, Pa	"	Tanks	955,200
Best Mfg. Co., Inc., Irvington, N. J	"	Bombs	734,187
Congoleum-Nairn Inc., Kearny, N. J	"	"	686,400
Federal Tin Co., Inc., Baltimore, Md	"	"	720,000
Francis Keil & Son, Inc., New York, N. Y	"	"	681,360
Kason Hardware Corp., Brooklyn, N. Y	"	"	698,442
Blaw-Knox Co., Pittsburgh, Pa	TVA	Steel towers	691,458
Jones & Laughlin Steel Corp., Pittsburgh, Pa	War	Shell	1,057,500
Jacobson & Co., Inc., New York, N. Y	"	Engine testing units	534,195
Clark Equipment Co., Battle Creek, Mich	"	Tractors	1,863,552
Lockheed Aircraft Corp., Burbank, Calif	"	Airplanes	92,277,800
General Motors Corp., Detroit, Mich	"	Engines	86,320,454
Glenn L. Martin Co., Baltimore, Md	"	Turrets	19,007,247
Commercial Shearing & Stamping Co., Youngstown, Ohio	"	Trailers	320,147
Sperry Gyroscope Co., Inc., Brooklyn, N. Y	"	Automatic pilots	37,534,980
Bendix Aviation Corp., Bendix, N. J	"	Altimeters	1,686,830

NAMES in the NEWS

Charles E. Adams, chairman of the board, Air Reduction Co., Inc., has succeeded Arthur D. Whiteside as head, Iron & Steel Branch, Office of Production Management. Mr. Adams was an administrative assistant to E. R. Stettinius, Jr. on the old National Defense Advisory Commission, and has been an alternate employer representative on the National Defense Mediation Board.



C. E. ADAMS

John H. Ashbaugh was appointed manager of manufacturing and engineering, Merchandising Division, Westinghouse Electric & Mfg. Co. Mr. Ashbaugh had been acting manager of the department since January. He started with Westinghouse in 1918, and in 1931 became assistant manager of engineering, Springfield Works. Charles G. Wallis has been named works manager, Westinghouse Electric Elevator Co., Jersey City, N. J., succeeding Ellis L. Spray who was recently appointed manager of the new Westinghouse plant near Philadelphia. Joining the elevator company in 1928, Mr. Wallis served as a design engineer, chief inspector and general foreman. Henry B. Duffus, former supervisor of safety and plant protection, East

Westinghouse Managers May Head Vultee

J. H. ASHBAUGH

C. G. WALLIS

T. M. GIRDLER

Springfield, Mass. works, was named mechanical safety engineer. R. W. Gemmell, since 1939 in charge of Aviation Sales, is serving on the staff of the Emergency Products Division and will supervise government negotiations involving ordnance equipment and special defense products. William M. Work who has been working on special assignments at the East Pittsburgh Works, has become supervisor, office systems of the District Manufacturing and Repair Department.

Charles H. Bailey succeeds Gus C. Detlefson as manager, Bridgeport, Conn., Division of the Crane Co. He had been assistant manager. Mr. Detlefson was transferred to Chicago plant as works manager.

William J. Barsanti, who has been in charge of procurement of tools and repair parts for Ford Motor Co., was assigned by the Division of Purchases, Office of Production Management, to the Motor Transport Division of the Army Quartermaster General, as an adviser on the procurement of tools and repair parts. Harold A. Manderson, superintendent of purchases, Continental Can Co., was assigned to the Raw Materials Division, OPM, as purchasing adviser. John Morrow, Jr., vice-president in charge of purchasing, International Harvester Co., was appointed purchasing adviser to the Army Ordnance Department. Ernest F. Pierson of the American Steel & Wire Co. was named purchasing consultant on wire and cable to the equipment and supply procurement branch.

Cecil C. Burns, process engineer, Remington Arms Co., Bridgeport, Conn., has been transferred to new Remington plant at Salt Lake City, Utah.

Tom M. Girdler, chairman, Republic Steel Corp., will become chairman and executive officer, Vultee Aircraft, Inc., and Consolidated Aircraft Corp., when and if companies are merged. Mr. Girdler will continue as chairman of Republic, but "will devote as much time as necessary to the job of gearing production of planes to the greatly accelerated plane building program."

Russell J. Greenly, chief of training and education, Carnegie-Illinois Steel Corp. will assume additional duties as acting chief of the personnel division. He succeeds J. Edward Johnson who was recently promoted to superintendent of industrial relations, Clairton Works. Transfer of Charles D. Feight, former superintendent of industrial relations at Clairton, to the staff of the vice-president in charge of industrial relations was also announced. Edward P. Woodward, former personnel assistant at Pittsburgh, has been transferred to the District Works, Youngstown, Ohio.

A. A. Gustafson, has been appointed director of personnel and safety, Buda Co., Harvey, Ill. He was previously associated with the Anderson Co., Hubbard Steel Foundry Co., B. F. Gump Co. and Schweitzer-Conrad Co.

D. Hayes Murphy, president, Wiremold Corp., has been named assistant to Walter Whitney, Jr., who is deputy director, Control Division, Office of Production Management.

Thomas P. Nickell, general manager, LeRoy Plow Co., will serve as a senior specialist in the farm equipment unit, Office of Price Administration.

A. H. Nicoll was elected president, Graybar Electric Co. He has been with the company for 30 years. Vice presidents elected at the same time are: G. F. Hessler, D. H. O'Brien, and E. W. Cashman.

Herman W. Steinkraus, vice-president, Bridgeport Brass Co., was named general manager, succeeding the company's president Ralph E. Day who had to relinquish active charge due to illness. Mr. Steinkraus will continue as a vice-president and director.

William S. Wilbraham who has been manager of sales, Lukenweld, Inc., has been promoted to manager of costs. He is succeeded as manager of sales by Robert C. Sahlin, assistant manager of sales.

PLANT EXPANSION

Adel Precision Products Corp. has broken ground for $200,000 additions to its Burbank, Calif., plant. Production will be doubled by this fourth addition in four years.

The Defense Plant Corporation, subsidiary of the Reconstruction Finance Corporation, has authorized the following lease agreements for plant and machinery expansion:

Aetna Ball Bearing Mfg. Co., Chicago, Ill., $410,565.

Blaw-Knox Co., Pittsburgh, Pa., $1,740,200.

General Alloys Co., Boston, Mass., $91,163.

General Electric Co., Fort Wayne, Ind., $25,011,838.

A. W. Hecker, Cleveland, Ohio, $199,130.

John Bath & Co., Inc., Worcester, Mass., $405,000.

Thompson-Whitney Machine Co., Hartford, Conn., $263,777.

Thompson Aircraft Products Co., Cleveland, Ohio, $1,589,433.

United Drill & Tool Corp., Chicago, Ill., $1,942,701.

Wayne Tool Co., Waynesboro, Pa., $60,000.

W. L. Brubaker & Bros. Co., Millersburg, Pa., $54,946.

Wood Newspaper Machinery Corp., Plainfield, N. J., $335,952.

Wright Aeronautical Corp., East Paterson, N. J., $4,974,200.

Douglas Aircraft Co., Inc., Santa Monica, Calif., is building three new machine shops at a cost of $128,000.

E. F. Houghton & Co., Philadelphia, Pa., has completed a three-story office building.

Lockheed Aircraft Corp., Los Angeles, Calif., has leased the Willys-Overland automobile plant for over three years. It will be used for the manufacture of sub-assemblies for Hudson bombers.

P. R. Mallory & Co., Inc., Indianapolis, Ind., has purchased the local branch building of the Ford Motor Co.

Pacific Bridge Co., San Francisco, Calif., has leased the Thomas Machine Works, at Los Angeles Harbor, and will

enlarge it for production work on steam engines and other gear for freighters planned by the United States Maritime Commission.

Timken Roller Bearing Co. will re-equip the Savannah Avenue plant in Canton, Ohio, for the manufacture of 37 mm. shot.

Timm Aircraft Corp., Van Nuys, Calif., will erect a factory building on a sight adjoining the Los Angeles Metropolitan Airport. Cost will be $100,000.

Zollner Machine Works, Fort Wayne, Ind., has awarded a contract for a $240,000 addition to its plant.

BUSINESS ITEMS

American Gas Furnace Co. has appointed J. E. von Maur representative in southern Ohio with headquarters at 63 South High St., Columbus, Ohio. Mr. Earle S. Dudley succeeds Mr. W. F. Faber as representative in eastern New York.

Bass Foundry & Machine Co., Fort Wayne, Ind., has been sold to Thomas W. Simmons of Los Angeles.

Buda Co. has appointed Ralph R. Hayes sales manager of the Eastern District. He will be attached to the New York Office at 253 W. 64th St., York, N. Y.

Bunting Brass & Bronze Co. has moved its Atlanta, Ga., sales office to 542 Spring St., N.W., and its Kansas City, Mo., office to 1821 McGee St.

Carboloy Co., Inc., has centralized its sales engineering department under K. R. Beardslee, sales manager. Martin Muhling, and Earl Glen have been appointed assistant sales managers in charge of this activity.

Carnegie-Illinois Steel Corp. has appointed Wm. P. Andrews manager of sales, Cleveland District. He had been manager of sales, Cincinnati District.

Chain Belt Co. has announced the appointment of Dow & Co. Inc., 1820 Elmwood Ave., Buffalo, N. Y., as distributors in the Buffalo and Rochester area.

Chicago Pneumatic Tool Co., has promoted E. R. Goss to branch manager, El Paso, Texas. He succeeds E. J. Coughlin who died in an automobile accident in October.

Despatch Oven Co. announces the appointment of Shea-Brownell Co., 3908 Olive St., St. Louis, Mo. as representative in the Missouri territory.

Graybar Electric Co., Inc., has named T. W. Conrad, acting manager, Omaha, Neb., office. Former sales manager, Tulsa, Okla. office, he succeeds F. J. Saffer.

Jackson Products Co. has moved into a new factory at 3265 Wight St., Detroit, Mich.

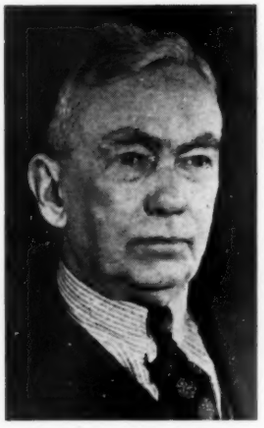
John A. Roebling's Sons Co. has promoted Eugene King to manager, Cleveland branch. He succeeds Raymond R. Newell who retired December 1.

Simmons Co., Watertown, Mass., has sold its manufacturing plant to the U. S. Government for expansion of the Watertown Arsenal. The Simmons Co. will continue manufacturing operations in Watertown until new facilities are ready in Somerville, Mass.

OBITUARIES

Hart O. Berg, 76, formerly assistant manager, Colt's Patent Fire Arms Mfg. Co., died Dec. 9. Mr. Berg, who developed the Browning machine gun, spent most of his life working on the development of munitions.

Frank Conrad, 67, since 1921 assistant chief engineer, Westinghouse Electric & Mfg. Co., died Dec. 11 in Miami, Fla. Dr. Conrad's interest in wireless telegraphy led to the founding of Station KDKA, pioneer broadcasting station. He went to work in October 1890



DR. FRANK CONRAD

as a bench hand in the original plant of the Westinghouse Company. Among his inventions is the round type electric meter which is now in universal use.

Guy Hutchinson, 58, former vice-president of the Hoffman Specialty Co., died Dec. 9 in Melbourne, Australia. He had also served as an official of Corbin Motor Co., and of Willys-Overland.

J. S. Marlowe, 60, district representative, Jessop Steel Co., died recently in Indianapolis, Ind.

Walter L. Marr, 76, pioneer automotive engineer and originator of the valve-in-head engine, died Dec. 11 in Detroit, Mich. Associated with David Buick, he aided in the first Buick experiments in 1901. Later he built one of the Oldsmobile Company's first two cars.

Julian Roe, since 1927 western sales manager, Crocker-Wheeler Electric Mfg. Co., died recently in Chicago.

Guy F. Strafer, 65, manager, Kansas City office, Allis-Chalmers Mfg. Co., died November 23. He joined the company's Kansas City office in 1907 and became manager in 1923.

Gage Production Upped—*This addition provides a 50 percent increase in the production of Webber Gage Co., Cleveland, Ohio. The new facilities are devoted exclusively to the manufacture of precision gage blocks. Constant temperature is maintained at all times to insure accuracy*

MEETINGS

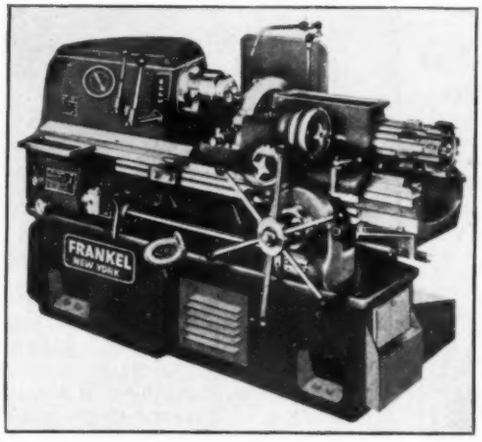
American Management Association, Annual Personnel Conference. Stevens Hotel, Chicago, Ill., February 4-6.

National Electrical Manufacturers Association. Convention. Palmer House, Chicago, Ill., February 2-5.

Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit, Mich. January 12-16.

SHOP EQUIPMENT NEWS

Tool Plate Set-Ups on Frankel Lathe Retained For Repeat Orders; Cross Slide Eliminated



Tool pressure per sq.in. is reduced because head rests on extended ways

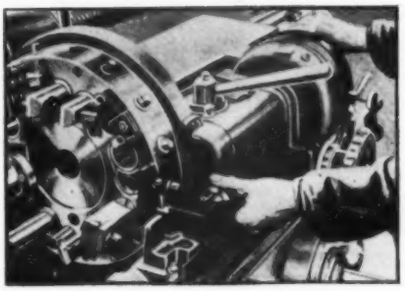
The customary cross slide is eliminated on the Type 2FR multiple tool lathe, introduced by Frankel Machinery Corp., 118 East 28th St., New York, N. Y. This is made possible by the large face plate type turret which revolves around a horizontal axis and replaces the customary vertical mounting of other designs of ram and saddle turret lathes. Rigidity of the tool head is increased because a large, long pivot bearing can be used in the Frankel method of supporting the turret. Thus, heavier cuts can be made with high accuracy.

All standard box or shank type tools can be mounted in the 15 in. diameter tool head, which provides for 16 tool positions near its circumference instead of the usual four or six. The tool head, with 16 longitudinal feeds from 0.00276 to 0.091 in. per minute and 16 cross feeds from 0.0025 to 0.0855 in. per minute, rests on projections protruding 6 in. beyond head. Bulk of tool pressure is taken up by these projections, considerably decreasing pressure per sq.in.

Stock is rigidly clamped in the spindle which is in line with the upper tool hole in the tool plate. Tools are indexed into working position by a mechanism located outside tool holes. When machining is completed tool plate can be pulled off and set-up retained intact for future repeat operations. Likewise, a previously set up tool head can be remounted by tightening only two bolts.

There are an infinite number of spindle speeds ranging from 37 to 1,270 r.p.m. Longitudinal feed on the tool is effected by a pinion through a rack. Reversible cross-feed is actuated by a pair of bevel gears and drives through a shaft and worm speed-reducing unit. Cross-feed may be actuated by hand. Both feeds are equipped with independent overload safety clutches, thus preventing tool or power transmission breakage.

There is an allowance hole in tool head permitting 2 in. or less bar stock to go through, so that tool works close to clamping collet when cutting off or grooving long pieces. An eye bearing behind tool plate supports such long work. This assures vibrationless, smooth operation. With goose neck tools chuck work up to 20 in. can be profitably performed. Extra accessories include thread chasing attachment, automatic chucking and feeding device, longitudinal and transverse copying apparatus and an eight position stop drum. The latter is used for longitudinal hand feeding.

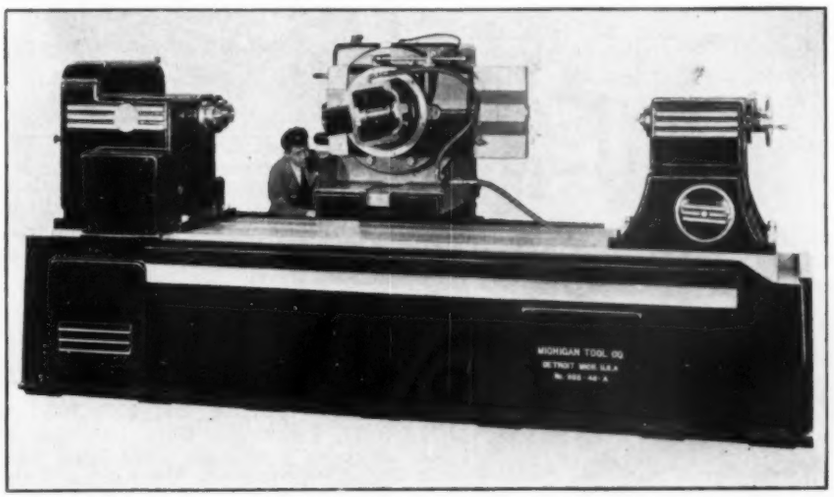


Tool plate, holding 16 tools, is easily removed and set-up retained for later use on repeat orders

The machine is delivered with chip tank and motor driven coolant pump. Inclined chip tank is located beneath the ways and chips fall freely into tank through wide space between the ways. The vees are covered to prevent damage from dust and chips. Swing over ways is 20 in., while maximum distance between spindle flange and tool head is 28¾ in. Spindle bore is 2⅛ in. With motor the machine weighs approximately 6,000 lb.

Michigan Tool Announces Gear Shaving Line; Three Models Finish 1 to 48 In. Gears

A new line of gear finishing machines making available the crossed-axis principle of gear shaving for completing gears up to 4 ft. in diameter and 20 in. face width, has been announced by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. Three sizes are included in the line with gear capacities of 1 to 24 in., 2 to 36 in., and 4 to 48 in. In the larger



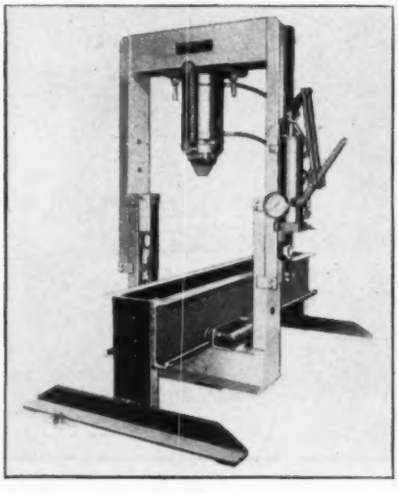
machine work rotates in engagement with the shaving cutter, and cutter follows across the face of the gear at predetermined speed. Two optional methods of finishing are available. In the first, cutter slide reciprocally translates parallel to the work axis. At each end of translation cutter is fed toward the work until a limit is reached. Before terminating the cycle, cutter travels a predetermined number of translations.

Cutter slide is set in a vertical position for the second method. Complete cycle consists of one translation of cutter, and return at right angle to the work axis. For this method a number of feeds and finishing translations can be secured. Control of this larger machine throughout operating cycle is entirely electrical. Red, amber and white lights indicate various circuit conditions existing during the operation. Selector switches determine the direction of rotation of the work.

For set-up process a jog button permits inching the work drive motor in the forward direction. Two sets of work centers having a maximum distance between them of 97 in. are included. Work weighing more than 2,500 lb. can be supported between the larger pair. Two work spindles have variable speeds ranging from 7 to 44 r.p.m. for the larger and from 40 to 375 r.p.m. for the smaller. Feeds range from 0.45 to 7.2 in. per min. The two smallest machines have four spindle speeds ranging from 109 to 313 r.p.m. Twelve feeds from 0.314 to 9.485 in. per min. are provided. Unlike the 28 in. machine, the 24 and 36 in. sizes operate by cutter reciprocation. Cutter is power driven and work follows, with cutters fed radially into the work.

125 Ton Hydraulic Presses Announced by Bee Line Co.

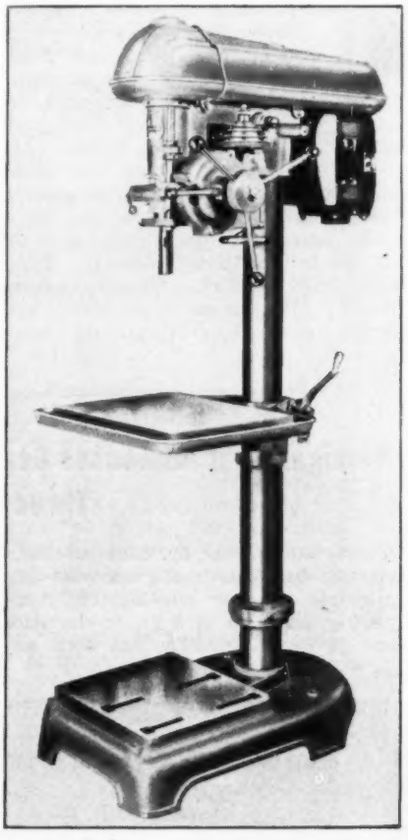
The Bee Line Co., Davenport, Iowa, has announced a 125-ton industrial hydraulic press. Mounted on a movable roller bearing carriage, the unit will meet practically all requirements



where heavy pressing is necessary. Carriage permits the application of pressure at any point in an 84 x 34-in. area bed. Jack carriage can be raised or lowered 16 in. with a minimum space between ram and bed of 2 in. Maximum space is 28 in. Ram travel is 10 in. The jack has a three-speed pressure pump. Overall dimension of the complete machine is 8 ft. by 4 ft. 8 in.

Walker-Turner's Drill Press Has Power, Hand or Foot Feed

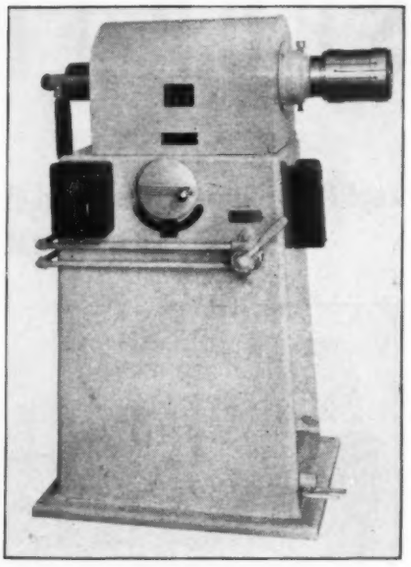
A 20-in. drill press available in single or four spindle models with power, hand or foot feed was recently developed by the Walker-Turner Co., Plainfield, N. J. Four rates of feed are provided for each of th five spindle speeds. This range will handle effi-



ciently drilling and reaming operations on 1 in. to $\frac{1}{16}$ in. cast iron. Built-in clutch which is part of the worm drive assures positive action at all points of spindle travel.

Schauer Variable Speed Lathe Equipped With Expanding Mandrel

Schauer Machine Co., 2060 Reading Road, Cincinnati, Ohio, has recently equipped a variable speed lathe with expanding mandrel for holding work. Designed especially for polishing and



finishing engine barrels of aircraft engines, the unit can be supplied with single or two-speed motor. Infinite selection of spindle speeds between 25 and 4,000 r.p.m. is provided in a ratio of 5½ to 1 with single-speed motor and 11 to 1 with the two-speed motor. Air operated mandrel is controlled by hand or foot valve. Automatic brake is applied when operator depresses the foot treadle which opens the motor circuit.

Colonial Broach Adds to Line Of Junior Presses for Small Parts

Colonial Broach Co., 147 Jos. Campau, Detroit, Mich., has added ½ and 1 ton models to its line of Junior presses. Designed primarily for small parts, these presses have platen depth of 9½ in., platen width of 14 in. with 2½ in. slot and throat depth of 5½ in. Ram stroke is 12 in. Ram speed down is 30 ft. per min., while return speed is 60 ft. per min.

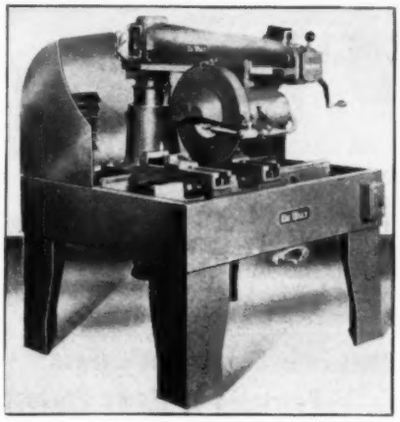
Both of these models are suitable for bench and pedestal mounting. Base dimensions are 17x24½ in.

Metal 4 In. Thick, 12 In. Wide Cut With DeWalt Machine

Machine for straight cutting metal 4 in. thick by 12 in. wide has been introduced by DeWalt Products Corp., Lancaster, Pa. This machine, powered with a 10 hp., 1,800 r.p.m. electric motor, will also make 45 deg. angle cuts in material 8 in. wide. Cantilever arm of cast nickel molybdenum semi-steel carries the motor on a bronze slide block that travels back and forth. Slide bearing surface of the slide block assures the utmost rigidity and accuracy.

Air operated vises can be adjusted to handle frail material or to rigidly grip the toughest cut. The vises are automatically opened or closed by a trip valve that releases the vises when slide block travels to the rear of the machine, and closes them as the cutter comes forward. An acme threaded speed shaft runs through the slide block within the arm.

For making angle cuts the cantilever arm can be swung right or left 45 deg. and firmly locked in any position. Cutting blade is completely protected with a steel guard which has a



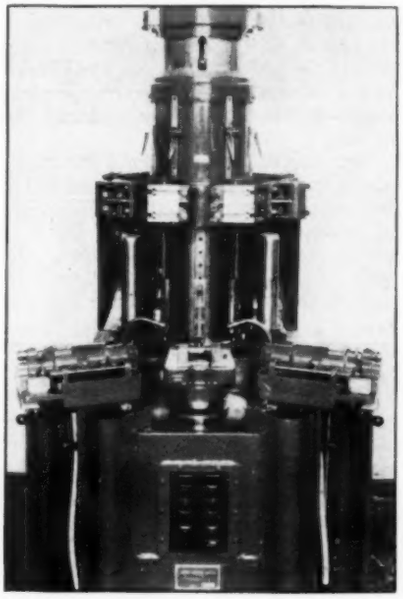
detachable front panel for quick changing of the cutter. The coolant spray nozzle is attached to the guard in such a way that it conveniently sprays all the different widths of material. The machine requires 16 sq.ft. of floor space, is 60 in. high and weighs approximately 2,000 lb.

Six-Faced Turret, Two Side Heads On Production's Chucking Machine

An automatic chucking machine with a rigid central column bearing a six-faced turret and two side heads has been put on the market by Production Machinery Development Co., 4845 St. Aubin Ave., Detroit, Mich. Turret reciprocates vertically and rotates by a selective indexing mechanism. Side heads, mounted at the front of the machine, are equipped for vertical and horizontal motion.

Cuts can be taken upward or downward for turning, or tool may be fed toward the center or from the center outward for facing cuts. Turret movement is selectively controlled for each face by adjustable contacts on the six faced control drum. Cycle is rapid advance, coarse feed, fine feed, stop, dwell, rapid return and index.

Spindle has 3 in. diameter nose threaded for standard chucks and face plates. Nose is bored hollow 1½ in. and is threaded on the lower end for air cylinder or other mechanical chuck-

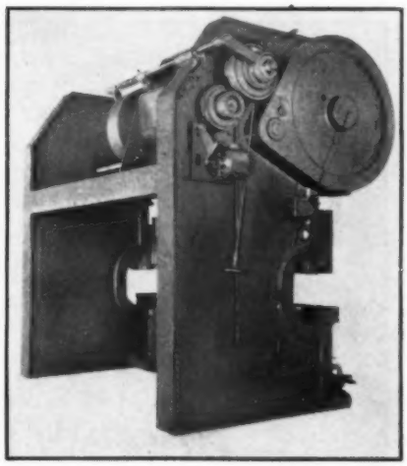


ing device. Spindle has 18 speeds from 10 to 1,775 r.p.m. Maximum diameter of work is 16 in. Boring bar depth of turret is 7 in.

Side heads have 9 in. vertical and 3½ in. horizontal movement. The horizontal range may be adjusted for any part of a 16 in. circle. The six 12¾ x 4½ in. turret faces have a vertical travel of 14 in. Six tool holders are furnished for turret and four 2 in. diameter tool bars are supplied for side heads. The machine weighs 6,500 lb., and occupies a floor space 48 x 66 in. Maximum height is 126 in.

Steelweld Automatic Clutch Eliminates Physical Effort

The usual physical effort required to engage the clutch manually has been eliminated by the electrically-operated clutch and brake mechanism developed for bending presses by the Steelweld Machinery Division, The Cleveland Crane & Engineering Co., Wickliffe, Ohio. The mechanism is set in operation by depressing the pedal which actuates the switch and brings a torque motor into play. Only a slight pressure is required since the treadle merely closes a small switch. Depending on whether the clutch or brake is being engaged, gear segment is brought to one or the other extreme position by torque motor. A shaft



connecting the clutch and brake operating levers is worked by connecting rod from the gear segment through a toggle.

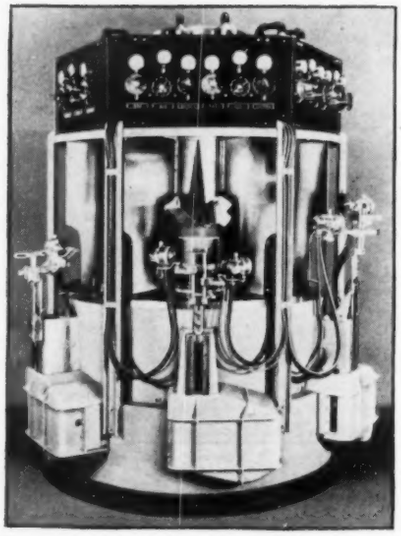
Torque motor is under power only when the clutch is engaged. When power is cut, a heavy spring on the clutch-brake connection shaft applies the brake. Depressing the foot treadle causes the clutch to become engaged and the brake disengaged; depressing it a second time produces the reverse action, that is, disengages the clutch and engages the brake.

With the clutch engaged, the press ram operates continuously until the treadle is depressed. All Steelweld bending presses can be furnished with the electrically operated clutch and brake, although this mechanism is particularly desirable for the larger machines that are used for forming plate of ½ to 1 in. and greater thicknesses. In addition to fast snappy clutch and brake action, there is a considerable reduction in wear because of the decreased clutch and brake slippage.

Rapid Aluminum Coating of Cylinders Possible With Metallizing Machine

From 30 to 40 complete aircraft engine cylinder assemblies can be coated per hour with aluminum or aluminum alloy by the automatic metallizing machine manufactured by the U. S. Galvanizing & Plating Equipment Corp., 27 Heyward St., Brooklyn, N. Y., in collaboration with the Metallizing Engineering Co., Inc., 4107 41st Ave., Long Island City, N. Y. Cylinder is loaded at station No. 1 of the machine. It is automatically indexed to Stations 2, 3, 4 and 5 at which spray guns coat the entire unit. Station 6, the final step in the cycle is for inspection and unloading.

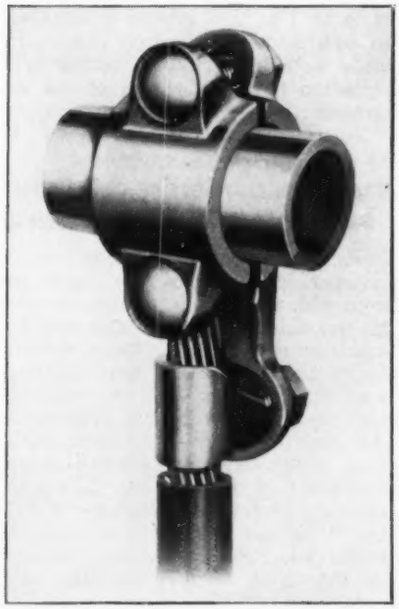
Not only are coatings performed more rapidly, but with greater accuracy and consistency than with manually-handled guns. For instance, coatings on and between closely-spaced deep fins must be applied at precision angles that are almost impossible to maintain by hand operation. Other applications



of metallizing are on shafts, spindles, and other rotating and reciprocating mechanisms. A further use is to apply corrosion-resistant surfaces of aluminum and zinc to such items as tanks and structural steel.

T-Connector for Tapping Cable From Tubing Introduced by Burndy

An all-clamp type T-connector for tapping cable from tubing was recently introduced by the Burndy Engineering Co., Inc., 107 Eastern Blvd., New York, N. Y. A flattened U-bolt on the tap accommodates a large range of cable



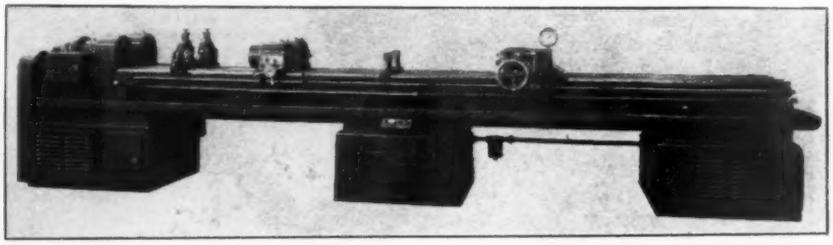
sizes. In addition, the compressive range of the U-Bolt makes it suitable for clamping flexible and extra-flexible cables. Where mechanical stresses are great, two U-bolts may be used. The large flat clamping surface insures good contact without cutting or mutilation of cable strands.

Double Spindle Machine for Gun Drilling, Boring, Reaming Introduced by Builders

A double spindle machine arranged for deep hole drilling gun barrels from the solid, which can also be used for either draw type or push type reaming and boring, has been introduced by Builders Iron Foundry, 9 Codding St., Providence, R. I. Each of the two spindles is driven from a 3-hp., 900 r.p.m. motor located in the base below the headstock of the machine. Power is transmitted through V-belt and gears to roller bearing headstock which carries a four-jaw independent chuck which is used for holding the barrel.

Barrels with a bore from 0.5 to 1.5 in. and a length up to 34 in. are secured in the chuck and supported in steady rests adjustable along the ways of the machine and in the barrel support and drill guide member. D-type deep hole drill is fastened in a chuck in the machine carriage. This is guided into the work through a drill guide bushing, located in the work support member, thus assuring concentricity of the bore with the outside of the barrel.

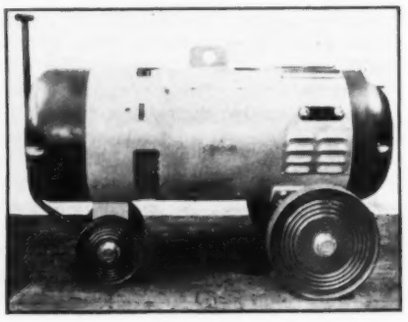
Machine is arranged to give six-spindle speeds from 175 to 1,030 r.p.m. and can be arranged for any specified speed desired. For drilling there are 11 speeds ranging from 0.0005 in. per revolution to 0.0029 in. per revolution. For reaming the 11 speeds range from 0.0035 to 0.02 in. per revolution. A torque overload protective device can be set to trip when any predetermined torque on the drill is reached. This protects drills against breakage when hard spots or other drilling difficulties are encountered. Coolant oil is pumped from a reservoir by two 10 gal. per minute pumps driven by 5 hp., 1,800 r.p.m. motors.



Steady Current Regardless of Arc Provided on Westinghouse Welder

Steady current regardless of arc length is provided by the arc control on the portable Flexarc welder announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Suitable for all-purpose welding in industrial plants, shipbuilding and general maintenance work, the machine is mounted on a four-wheel running gear. Ratings are 200, 300 or 400 amp. for 220, 440 and 550 volt a.c. circuits.

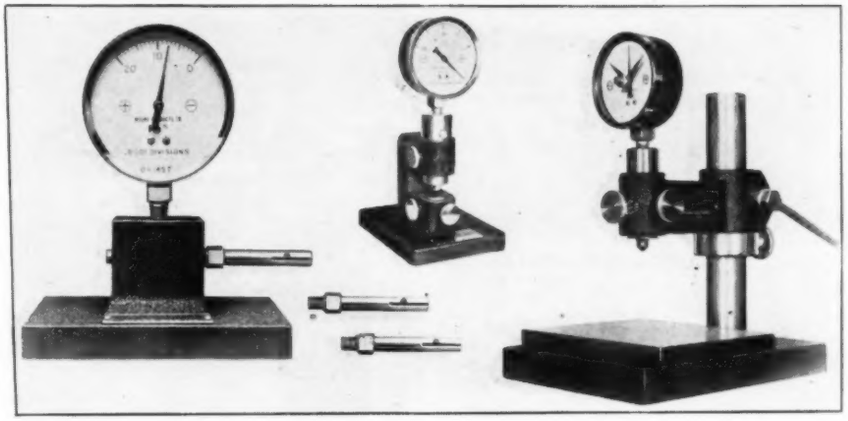
Current adjustment is obtained by a ball crank making it possible to preset the desired current before welding. In operation, a magnetic shunt is placed in the armature reaction flux path. Its position with respect to the main flux path determines the welding current. Thus, no field rheostat exciter or external reactor is required. Automatic burn-out protection is provided by a bi-metal relay mounted on the motor stator winding.



Pneumatic Comparator Gauges Developed by Moore Products

Small dimensional differences are accurately amplified and instantly shown on a dial indicator by the pneumatic comparator gaging equipment developed by the Moore Products Co., H and Lycoming Sts., Philadelphia, Pa. In operation a restricted amount of air from a filtered and regulated source of supply is admitted to the dial gage and measuring nozzle. With variations in size of the work piece the clearance from the nozzle is changed. This permits more or less air to escape which changes the pressure, which in turn are indicated on the dial in decimal parts of an inch.

Internal bore gaging, especially for small holes and long tubes, is quite simple. With this method, plug is merely a guide, and the measuring nozzles are recessed below the surface. Plug, provided with ample clearance over the minimum tolerance, fits loosely in the bore. The two nozzles are diametrically opposite so as to measure the true diameter and compensate for side movement of plug. A 90 deg. rotation



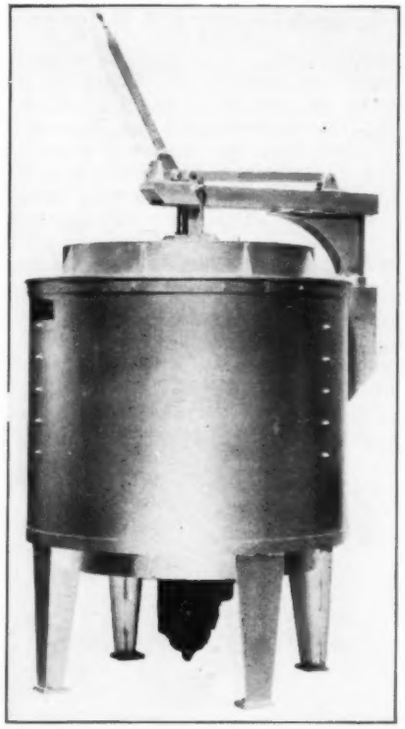
measures "out of round," while lengthwise motion measures taper and bell mouth conditions. Standard ring gages are slipped on the plug at periodic intervals for absolute comparison.

Amount of magnification can be made to suit the tolerance measurements with 0.001 in. indicated by 2 in. or more pointer movement. Dimensions are read within $\frac{1}{32}$ in. of edge of the work. In external gaging, a single nozzle takes the measurements from a hardened and ground surface plate. A circular chart recording meter can be used instead of the indicating dial to provide a permanent record.

Hevi Duty Convection Furnace Used For Temperatures Under 1400 F.

The pit type convection furnace, made by Hevi Duty Electric Co., Milwaukee, Wis., is used for all operations requiring temperatures up to 1,400 F., such as air drawing, heat-treatment of aluminum and low temperature annealing. The furnace is particularly suitable for handling small parts which can be readily loaded in the cylindrical basket. High velocity centrifugal type fan assures uniform heat penetration to all parts of the charge. As heating is accomplished principally by convection, possibility of radiant heat affecting the work is eliminated.

Special fixtures or shallow basket may be used for heavy parts or those in which distortion may occur on the underlying part of the charge. Heating elements mounted in radiant plates are evenly distributed around the entire side wall area. Cover consists of a heavy steel casing which incloses light weight insulation. Hand operated cover moving mechanism permits quick and easy operation. When cover is in the closed position it is sealed with an asbestos gasket. Furnaces come in eight sizes with basket loading space ranging from 12 in. diameter by 16 in. depth, to 28 in. diameter by 48 in. depth.



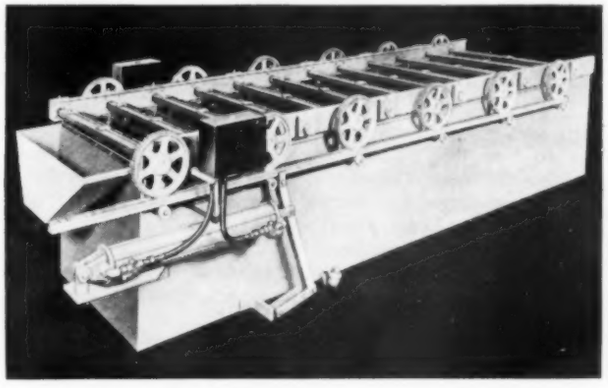
Reliance Dust Collector Makes Use of Waste Can

A large capacity dust collector capable of holding 75 lb. of chips and grit has been developed by the Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland, Ohio, for use with rough grinders. Equipment consists of a familiar galvanized waste can; a blower, driven by a 1 hp. motor, which sucks the dust at high velocity into the can; and baffles at the bottom of the can. Velocity and carrying power of incoming dust-laden air is lost as it circles in a cyclone motion around the outlet tube extending halfway into the container. Particles fall into a separating baffle at the bottom of the can. Baffle consists simply of two pieces of sheet iron set on edge and at right angles. This stops the spiraling effect of dust near bottom of the container and also eliminates possibility of any subsequent turbulence. Fabric outlet bag collects fine dust that has not already been deposited on the bottom.

Many Small Parts Processed By Udylite Parkerizing Unit

Large quantities of small parts can be processed with the automatic parkerizing machine introduced by the Udylite Corp., Detroit, Mich. It is being used on the production of .30 and .50 caliber machine gun links, Garand rifle among other small parts. Air or hydraulic driven, the machine is hopper-type. Parts are loaded in batches at one end and progressively move through the various dipping tanks. Each batch remains a separate unit throughout the cycle which includes cleaning, rinsing, parkerizing, rinsing, baking and oiling.

Large savings are made in floor



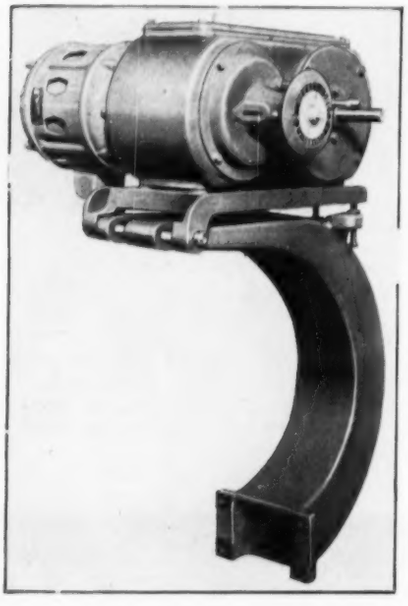
Automatic parkerizing unit finishes munitions parts

space, labor (8 to 10 hand operations are eliminated), material (operator does not touch material after it is loaded until it is discharged dry, needs no protective clothing), electric power, and installation. Better production control results because all batches of parts get the same treatment regulated by a time clock. Hoppers always operate in the same solution so that the most suitable material can be selected for each application.

No Special Support or Bracket Necessary for Motorized Drive

No special support or bracket is necessary for mounting the motorized variable speed drive for machine tools which was recently offered by Reeves Pulley Co., Columbus, Ind. Motor and variable speed units are mounted on a pivoting base at the top of a cast semi-steel bracket. Bracket can be easily and quickly attached to most machine tools by means of four cap screws. Jack screws in the bracket at the end opposite the speed control unit provide for maintenance of proper belt tension between driving unit and pulley on the machine.

Two sizes of bracket are available. Motodrive capacities are from ¼ to 10 hp. with speed ratios from 2 to 1 to 6 to 1. Using the Vari-Speed motor pulley, capacities range from ¾ to 7½



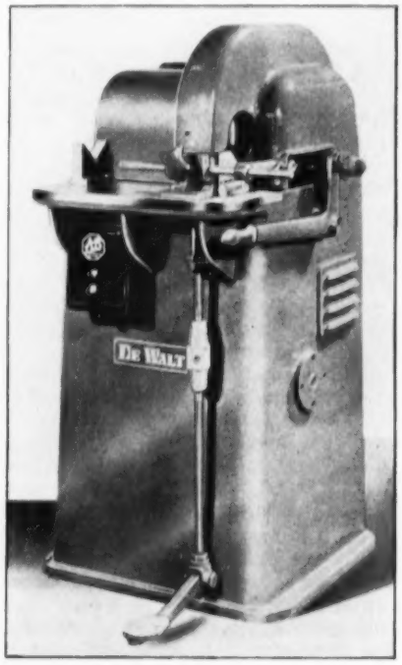
hp. and cover speed ranges of either 2¾ to 1 or 3 to 1 ratio.

Smooth, quiet, vibrationless transmission of power from drive to driven machine is assured. Any speed within the limits of the particular unit may be instantly obtained by turning a hand wheel. Both Motodrive and Vari-speed motor pulley are available for constant torque or constant horsepower applications.

DeWalt Cutter Recommended For 2 In. Diameter Solids

DeWalt Products Corp., Lancaster, Pa., has designed a high speed metal-cutting machine for round or square bars or tube stock of brass, bronze, copper, aluminum, duralumin, or light steel. Unit is recommended for 2-in. diameter solids, and up to 4-in. sections. Cutting wheel or saw blade is driven by a two-speed DeWalt built electric motor—5 h.p. at 3,600 r.p.m. or 2½ hp. at 1,800 r.p.m.

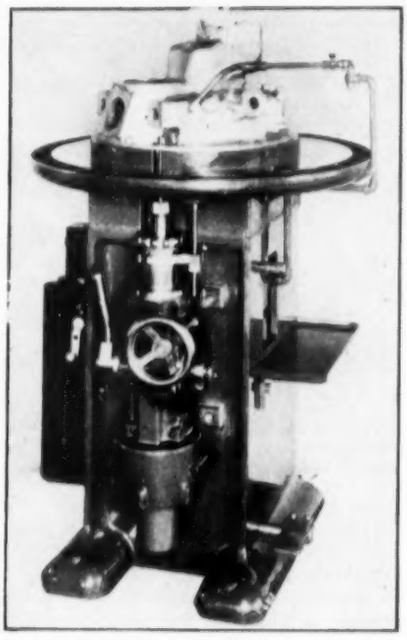
Cutter is fed forward toward the material by a downward motion of the cutter handle. This mechanism is so



balanced that it returns the cutter automatically after completing the cut. Two vee clamping blocks hold material rigidly in proper cutting position. A pedal operates this mechanism. For continuous cutting an adjustable stock stop is provided. Hinged cover folds back and a quick changer is provided for wheels or saw blades. The machine occupies 4 sq.ft. of floor space and is 50 in. high. It weighs approximately 775 lb.

Counterboring, Facing Machine Developed by Taft-Pierce

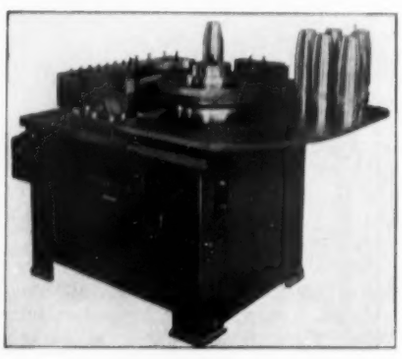
For counterboring or facing bosses through which a hole has been drilled but which, because of an obstruction, cannot be finished on a drill press, the Taft-Pierce Mfg. Co., 32 Mechanic Ave., Woonsocket, R. I., has announced a back spot facing machine. Part to be machined is mounted on a cast-iron table. Near the front of this table is a hole which allows the shank of the inverted counterbore to project through the table. Cutter is driven by



a spindle just under the table which is driven through bevel gears by a ½ hp. motor. Speeds of 170 r.p.m. for steel and 300 r.p.m. for aluminum alloys can be obtained. Spindle feed is operated by hand, either through a worm and wheel or by means of a rack and pinion. Power can be disengaged by a clutch if manual rotation of spindle is desired. Table has a maximum diameter of 31½ in. with working surface of 28 in. Table top is 37½ in. above floor. The machine occupies a floor space 34 x 32 in. and weighs approximately 1,200 lb.

Shell Inscribing, Scoring Done At Same Time by N & W Equipment

Inscription is marked permanently into the periphery of 75 mm., 90 mm. and 105 mm. high explosive shell at the same time shell are knurled or scored with the machine introduced by the Noble & Westbrook Mfg. Co., East Hartford, Conn. Scoring consists of a series of straight line scores into the band seat, while the marking consists of designation, lot number and date. Depending upon the handling facilities, 10 to 15 shell can be scored and marked per minute.



Gray-Mills Portable Coolant Pump Used With Lathes, Drill Presses

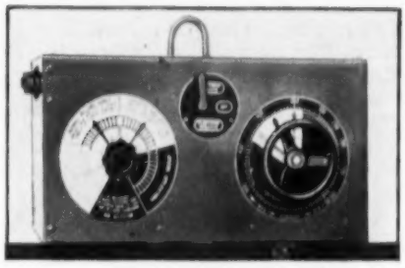
Portable coolant pump for use with lathes, drill presses, grinders, cut-off machines, small milling machines and screw machines has been introduced by Gray-Mills Co., 213 W. Ontario St., Chicago, Ill. Coolant flow is controlled by a wing nut. For machines not equipped with a tray table, a Gray "Flo-Bac" tray provides for coolant return to the pump. Capacity of the pump is 50 gal. per hr. Tanks, corrosion-resistant lined, hold 3½ gal. of

coolant. Standard equipment includes 5 ft. of ⅜ in. flexbile metal tubing with ¼ in. fitting at discharge end, 18 in. of flexible copper tubing with ¼ in. fitting and 7 ft. of heavy duty electric cord and plug. Unit which weighs less than 15 lb. has a bale handle for easy carrying from one machine to another. Protected induction type motor is 150 hp., 110 volts, single phase, 60 cycles a.c.

Lincoln Eliminates Meters From Welding Control Unit

Meters showing volts and amperes have been eliminated by improvement and simplification of the "Dual Continuous Control" for arc-welding machines, which is manufactured by the Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio. Through a job selector and current control, slope of the volt-ampere curve and the amount of welding current can be independently and accurately adjusted to suit every job encountered.

The recent development eliminates trouble and expense resulting from meter breakage and meter inaccuracy after a few months service. The current can be set and read from the dial. The reversing switch has been

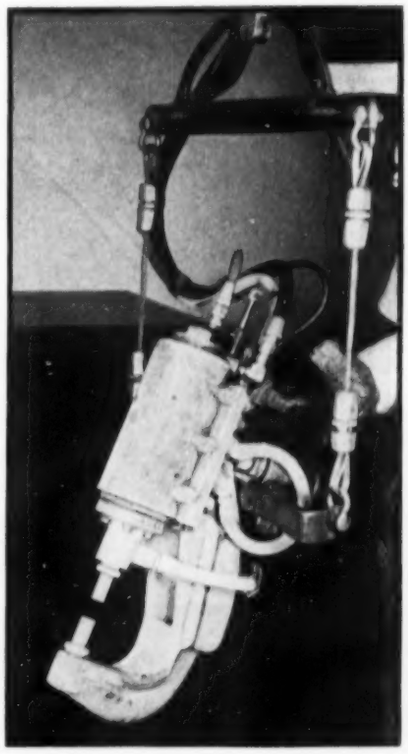


placed in the position formerly occupied by the meter. This makes available positive polarity reversal and quick verification by noting position of switch handle. Better quality welds and higher possible welding speeds are obtained.

Progressive Makes Portable Unit For Welding Aluminum Sections

Much aircraft welding cannot be taken to a stationary pedestal welder. So a portable resistance spot welder for tack and assembly welding aluminum sections in fixtures has been introduced by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich. In order to facilitate production of various shapes to fill specific manufacturing requirements, this mechanism has been built into a gun head which may be supplied with yokes to fit individual needs.

Gun is air-operated, employing two differential cylinders in tandem. Using normal factory airline pressure, a maximum point pressure of 1,200 lb. is produced. For structural spot welding of aluminum, the gun will handle two

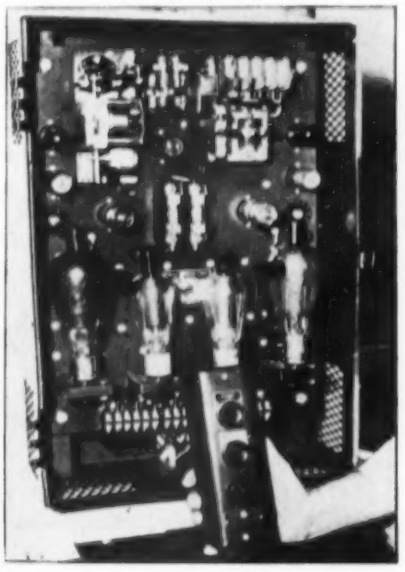


pieces of 0.040 in. thick, while for tack welding greater thicknesses may be handled.

One electrode can be retracted to permit clearing obstructions. Maximum stroke is 4 in. Design facilitates the application of refrigeration to the tip. Support of the gun is a universal type compensating hangar which allows positioning at any angle. The gun with its transformer may be used in combination with virtually any control equipment used for aluminum welding.

G. E. Control Permits Running D. C. Motors From A. C. Supply

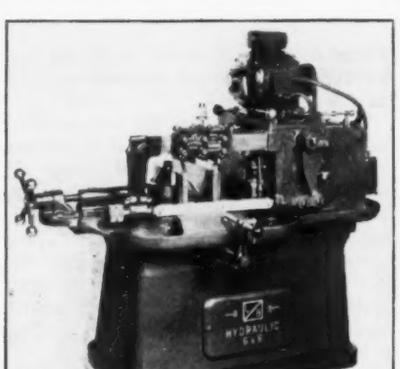
An electronic control system which provides simple stepless control of d.c. motors from a.c. lines, has been announced by the General Electric Co., Schenectady, N. Y. With this development, the flexibility of d.c. motors can now be combined with the economy and convenience of a.c. power distribution. The control in one unit provides



the means for electrically starting, stopping, accelerating and regulating the speed of a motor. Standard units will cover motor sizes up to 5 hp., 230 v. A.c. is changed to d.c. for the motor field and armature circuits by two pairs of thyratron tubes. The control compensates for changes in armature voltage drop, holding motor speed constant regardless of normal load and line voltage variations.

L. B. Hydraulic Hack Saw Has Infinite Number of Speeds

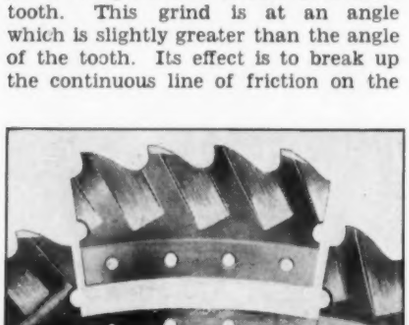
An hydraulic hack saw with infinite number of speeds has been developed by the L. B. Mfg. Co., P. O. Box 155, Vernon, Los Angeles, Calif. No manual labor is required to raise or lower saw frame. On completion of cut it rises hydraulically to the highest point. It



feeds under constant pressure. Graduated vise has a 45 deg. swiveling jaw. Integral coolant pump is synchronized with blade motion.

Atkins Improves Segmental Saws With Additional Relief Grind

E. C. Atkins & Co., 402 So. Illinois St., Indianapolis, Ind., have improved their line of segmental cold saws by relief grinding. This consists of an additional grind along the side of each individual tooth. This grind is at an angle which is slightly greater than the angle of the tooth. Its effect is to break up the continuous line of friction on the



side of the teeth. A further advantage is that the depression formed helps carry cooling or cutting compound into the cut. Elimination of wander in the cut is another aid brought about by relief grinding. Damage to a single tooth or group of teeth in Atkins cold saws is repaired by merely affixing a new segment to the blade.

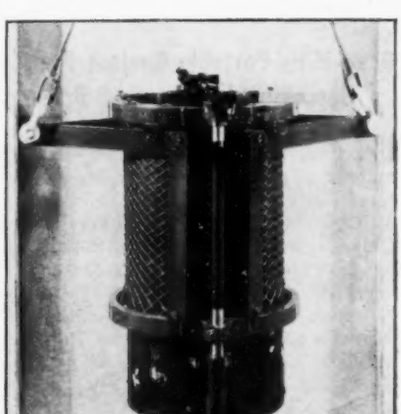
Industrial's Capacitor Used In Laboratories, Factories

A choice of any capacity value from 0.01 to 11.1 mf. in 0.01 mf. steps at the mere twist of three knobs, is provided by the Type DK decade capacitor offered by Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J. The capacitor, which is suitable for laboratory as well as industrial applications, is housed in a walnut cabinet with hinged cover and snap lock. The instrument measures 7 x 8 x 5¾ in. and weighs 8 lb. Etched metal panel has three knobs and dials calibrated directly, so that reading from left to right, totals up the value available at the binding posts.

Kellems Wire-Mesh Lifter Handles 4.7 to 16 In. Shell

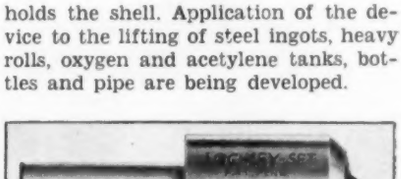
Adaptation of the principle of the electrician's wire-mesh cable grip to shell lifting has been made by the Kellems Co., 1911 Park Ave., New York, N. Y. Shell lifters of wire-mesh have been made by the Kellems Co. for projectiles from 4.7 to 16 in. Rods forcibly extend the mesh making it possible to grip an object of a smaller diameter than the mesh. Tension of the mesh

Worker places hand lifter on 55 mm. shell. When handles are closed, wire mesh tightens against shell



Shell lifter carrying 16-in. shell is placed in production line. Operating on the principle of the electrical industry's cable grip, lifter's wire mesh tightly grasps heavy shell. Other industrial applications are being worked out

holds the shell. Application of the device to the lifting of steel ingots, heavy rolls, oxygen and acetylene tanks, bottles and pipe are being developed.



Diamonds Set In "Big-Hed" Nibs Will Not Shift, Turn, Loosen

Diamonds set in the "Big-Hed" nibs manufactured by the Diamond Tool Co., Chicago, Ill. will not shift, turn or loosen in operation, thus making possible micrometer adjustment of each pass. The setting in these diamond nibs consist of two internal locking keys that are integrally cast on the slug-holding nib by forcing the molten metal into two internal key seats milled in the nib head. Nibs have large diameter heads which draw heat away from the grinding point. Heat is dissipated rapidly providing cooler dressing and preventing tool expansion. Closer tolerances can be held. Corrected face angles permit greater tool clearance without loss of strength or rigidity.

H-W Illuminating Grinder Shields Light Automatically; One Magnifies

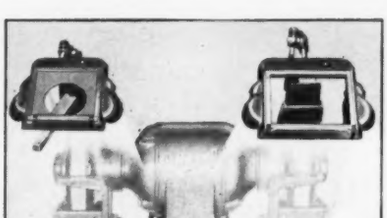
Iluminating shields for grinding wheels have been wired by the Hisey-Wolf Co., Cincinnati, Ohio, so that they automatically light when machine is started. Each guard has switch and two rough-surface bulbs. Frame is an aluminum casting. Model 3LLM has a 4½ in. magnifying lens with 10 in. focal length. This affords ideal set-up for

•It is the spirit of Christmas that prompts the men and women of the Kearney & Trecker Corporation to express the sincere wish for a joyous holiday to other men and women — the world over as they join to celebrate the time-hallowed day that has always signified "Peace on earth — good will toward men."

KEARNEY & TRECKER CORPORATION

KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

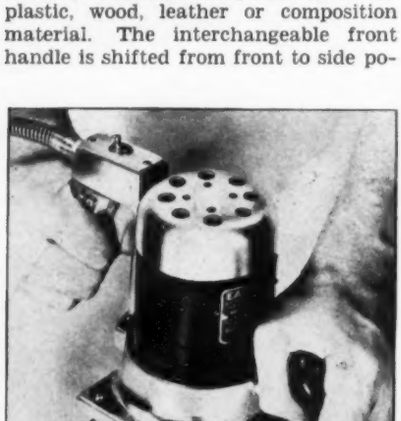
Milwaukee MILLING MACHINES



close grinding work. Plain glass under the lens prevents pitting. Model 5LL has a 9 x 7 in. clear laminated glass which is shatterproof. This shield is recommended for 12 in. and larger wheels, while Model 3LL, which is similar except for the 5 x 7 in. glass, is recommended for 10 in. and smaller wheels.

Detroit Designs Electric Sander For Heavy Two, Three Shift Duty

To meet the gruelling service of two and three shift duty, the Detroit Surfacing Machine Co., 7433 W. Davison St. Detroit, Mich., has introduced a Model XL easy reciprocating electric sander. The unit can be used for sanding, rubbing and polishing metal, plastic, wood, leather or composition material. The interchangeable front handle is shifted from front to side po-



sition for work in close corners, at right angles and directly against vertical surfaces. Fan and baffle plate increase flow of air through motor, insuring adequate cooling. The sander weighs but 6½ lb.

McKenna Turning, Facing Tools Have Steel Thickness Under Tip

A standard series of Kennametal tools in large turning and facing styles for heavy machining has been introduced by the McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa. A greater thickness of steel under the cutting point of the tip is permitted by the position of the tip in the shank. Thus, top surface or chip breaker can be ground without the necessity of grinding away steel. Furthermore, during the life of the tool the height of the cutting point is retained rather than lowered. Tools are available in all turning and facing styles and in all shank sizes from 1 in. up.

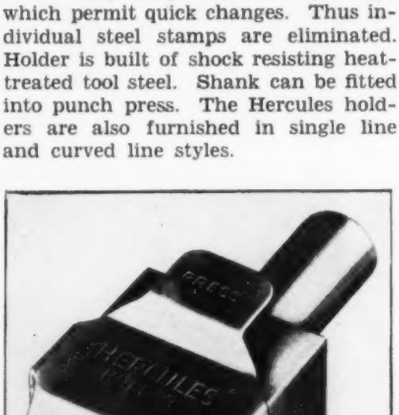
Retaining Ring Excludes Chips From Micrometer on Fray Head

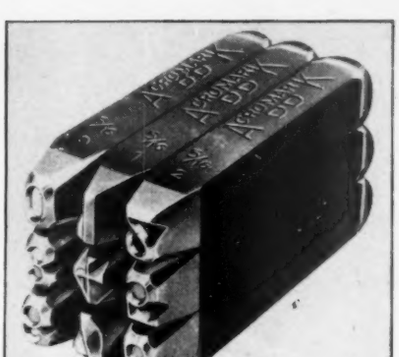
The retaining ring on the "Junior" model offset boring head, which is manufactured by Fray Machine Tool Co., Glendale, Calif., assists in carrying the load thrown on the tool carry-

ing block and excludes chips from the micrometer mechanism. This makes possible a round type of construction without the usual unsafe features. The head has a 2-in. body diameter with overall head length of 1⅝ in. Offsets are ⅞ in. Micrometer dial has 50 divisions of 0.001 in. each. There are three ⅜-in. receptacles for boring bars. Short length of any model insures accuracy and rigidity.

Acromark Two-Line Type Holder Eliminates Individual Stamps

Two-line stamp holders have been introduced by the Acromark Corp., 257 No. Broad St., Elizabeth, N. J. Lines hold heavy duty shoulder style type which permit quick changes. Thus individual steel stamps are eliminated. Holder is built of shock resisting heat-treated tool steel. Shank can be fitted into punch press. The Hercules holders are also furnished in single line and curved line styles.





Acromark Letters, Figures Mark Forgings, Stainless Steel

Double duty steel letters and figures which will mark stainless steel, forged parts and half hard metals, have been developed by the Acromark Corp., 257 No. Broad St., Elizabeth, N. J. Characters are deep and bevel is extra heavy. Each steel letter and figure is individually engraved and hand finished for accuracy. The business end of stamps has been tapered to the character so that area being stamped can be seen. These stamps have been used to cold stamp steels that were formerly stamped hot.

Haskins Puts Pneumatic Tires On Flexible Shaft Machines

R. G. Haskins, 2760 W. Flournoy St., Chicago, Ill., has equipped its heavy-duty truck-mounted flexible shaft machines with semi-pneumatic rubber tires. Unit shown is the Model HS-7 with 1 hp. motor.

Wabash Floodlight Bulb Designed For High Bay Lighting in Plants

A high-power floodlite bulb designed for high bay lighting in industrial plants with high ceilings, has been introduced by the Birdseye Division, Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y. The bulb delivers a concentrated flood of light that cuts through distance, haze and smoke to provide excellent illumination. The filament is mounted at the exact focal point of the parabola of the bulb, so

1942 ...A GOOD YEAR TO BUY *Precision* MACHINES!

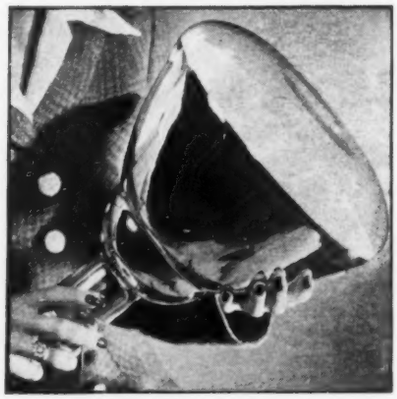
New requirements indicate that production still has a long way to go —that 1942 will be a year of much greater need for *the right kind of machines* if the vast quantities of defense materials now demanded are to be realized without sacrifice of accuracy. . . . Wherever production calls for precision boring, turning, facing, lapping, and accurately finished threaded work, a machine tool bearing the name of Ex-Cell-O, pioneer in precision machining, is *exactly the right equipment.* . . . This is why standard Ex-Cell-O Precision Machines are in the forefront throughout American industry—why many prime and sub-contractors, getting into full swing on defense work, are selecting Ex-Cell-O precision machine tools as an assurance of maximum production, accuracy, and economy in 1942.

EX-CELL-O CORPORATION • DETROIT, MICH.

PRECISION THREAD GRINDING—AN EX-CELL-O DEVELOPMENT THAT HAS ESTABLISHED NEW HIGH STANDARDS OF ACCURACY, SPEED AND ECONOMY FOR PRODUCTION THREADED WORK.

XLO

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS



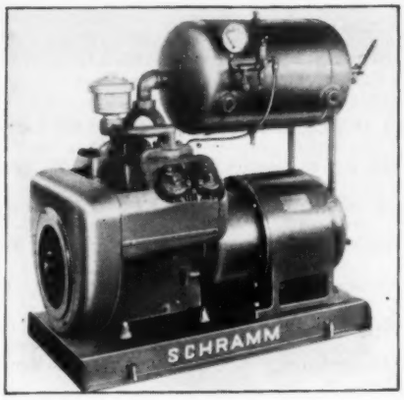
that light rays are forced straight out of the bulb without waste. Bulb is lined with pure polished silver to form a permanently brilliant reflector. Twelve sizes up to 1,500 watts are available.

MSA Respirator Uses Single Filter Replaced After Each Cleaning

A Dustfoe respirator with a single filter has been announced by the Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa. The respirator can be completely disassembled without tools in a few seconds. All parts are interchangeable and except for filters can be washed and sterilized. Filters are inexpensive and a fresh new filter can be inserted with each cleaning. The face piece may be shaped to fit individual face contours. Total weight is 3¾ oz.

Schramm Compressor Recommended For Drilling, Riveting Operations

A small compressor suitable for developing pressures up to 200 lb. have been placed on the market by Schramm, Inc., Westchester, Pa. The unit of four-cylinder V-type construction does not require cooling unit or running water. Being light weight, compact and vibrationless, expensive platforms, supports or foundations are not needed. This compressor is recommended for drilling, spraying, riveting, chiseling, chipping, and sand-blasting. Mechanical intake valve and long-life discharge valve are standard equipment.



Williams Box Pattern Wrench Designed for Greater Safety

A structural box pattern wrench, designed to bring greater safety to structural work, has been added to the line of chrome-molybdenum "Superrenches" manufactured by J. H. Williams & Co., 225 Lafayette St., New York, N. Y. The 12-point box head insures a firm hold on the nut and offset handle provides maximum clearance. Long tapered handle is preferred by steel workers for lining up bolt holes. These wrenches are available in six sizes and have openings from $1\frac{7}{16}$ to $2\frac{3}{8}$ in.

NEW MATERIALS

Houghton Quenching Oil Aids Heat-Treating Explosive Shell

For rapid quenching which is essential in the heat-treatment of high-explosive shell, E. F. Houghton & Co., Third, American & Somerset Sts., Philadelphia, Pa., has announced Houghto-Quench "G" oil. This oil was designed to meet the proper range of physical properties — including fire, flash and viscosity—as well as stability and freedom from sludging. Included in its composition is an agent which acts as a stabilizer, reducing oxidation or fractional distillation. The oil has rapid wetting out properties, spreads a continuous film over the hot surface of the metal, and prevents formation of gas pockets.

Armstrong Gasket Material Seals Oil, Water or Gasoline

Armstrong Cork Co., Lancaster, Pa., has developed a fibrated leather gasket material which is recommended for sealing oil, water or gasoline. It may also be used for other general gasketing where temperatures do not exceed 300 F. and where acids or alkalis are not encountered. The material is supplied in rolls and sheets in standard widths up to 48 in. Special shapes diecut to specifications also can be supplied. Known as Armstrong's No. 841, this material is compressible, has a high percentage of recovery and takes a minimum amount of permanent set.

TRADE PUBLICATIONS

BLOWER WHEELS—Blower wheels for forced warm air heating and air conditioning are described in a four-page bulletin published by Morrison Products, Inc., E. 168th St. and Waterloo Rd., Cleveland, Ohio.

BRIGHT ANNEALING — Equipment for bright annealing stainless steels is described in Bulletin B-4 put out by the Drever Co., 748 E. Venango St., Philadelphia, Pa.

CENTRALIZED LUBRICATION—The Farval Corp., 3293 E. 80th St., Cleveland, Ohio, recently published a booklet on centralized lubrication systems and lubrication equipment.

CLEANING—Description of salt cleaners and comparison of cleaning materials are included in a booklet published by Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CONTOUR SAWING ATTACHMENTS—A six-page folder of attachments for contour sawing machines has been published by Continental Machines, Inc., 1301 Washington Ave. So., Minneapolis, Minn.

CONTROL SYSTEMS — Automatic program control systems of time-temperature are described and illustrated in Bulletin No. 85-17 of the Brown Instrument Co., Wayne and Robert Aves., Philadelphia, Pa.

DRAFTS—Equipment for properly controlling furnace drafts are included in a 20-page booklet on drafts published by the Hays Corp., Michigan City, Ind.

ELECTRODE PRESSURE — General Electric Co., Schenectady, N. Y., describes an electrode pressure gage in Publication GEA-3628. The importance of correct electrode pressure is outlined along with the bad results of too little or too great pressure.

EMPLOYEE IDENTIFICATION — A study of employee control at plant en-

REMOVING 18 LBS. of nitrided steel IN 7 MINUTES

What's the P-Q* of your cutting tools?

Finning air-cooled airplane engine cylinders at the rate of 7 cylinders per hour . . . removing 18 lbs. of nitrided steel in 7 minutes—that's the performance record with SUNICUT. . . . A record that helps maintain the high P-Q* (Production Quota) set by this large airplane engine manufacturer with an "all-out" production schedule.

In the airplane industry, and in metal working industries of all kinds, SUNICUT is helping manufacturers maintain a higher P-Q* for their cutting tools. The excellent heat absorbing and wetting out properties of this modern transparent, sulphurized cutting oil make possible increased speeds and feeds and improved finishes with precision.

On performance alone, SUNICUT has won recognition. A test —in your own shop—may prove to be your first step toward making possible a higher P-Q.*

Write to SUN OIL COMPANY, PHILADELPHIA, PA.

SUNICUT

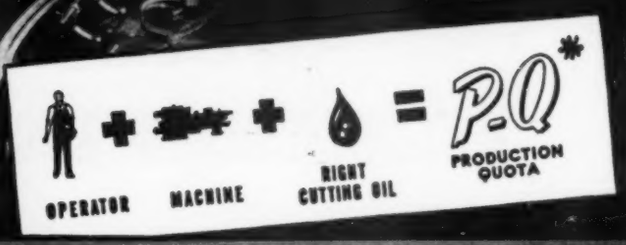
NON-EMULSIFYING . . . TRANSPARENT

CUTTING OIL

PERFORMANCE DATA

OPERATION—Finning Air Cooled Airplane Engine Cylinder.
MACHINE—Jones & Lamson Heavy Duty 16" Fay Automatic Lathe.
MATERIAL—Nitrided Steel.
TOOLS—47 H.S.S. tools in a single bank, removing 18 lbs. of metal in 7 minutes cutting time.
CUTTING LUBRICANT—Sunicut

Photo Courtesy of
JONES & LAMSON MACHINE CO.



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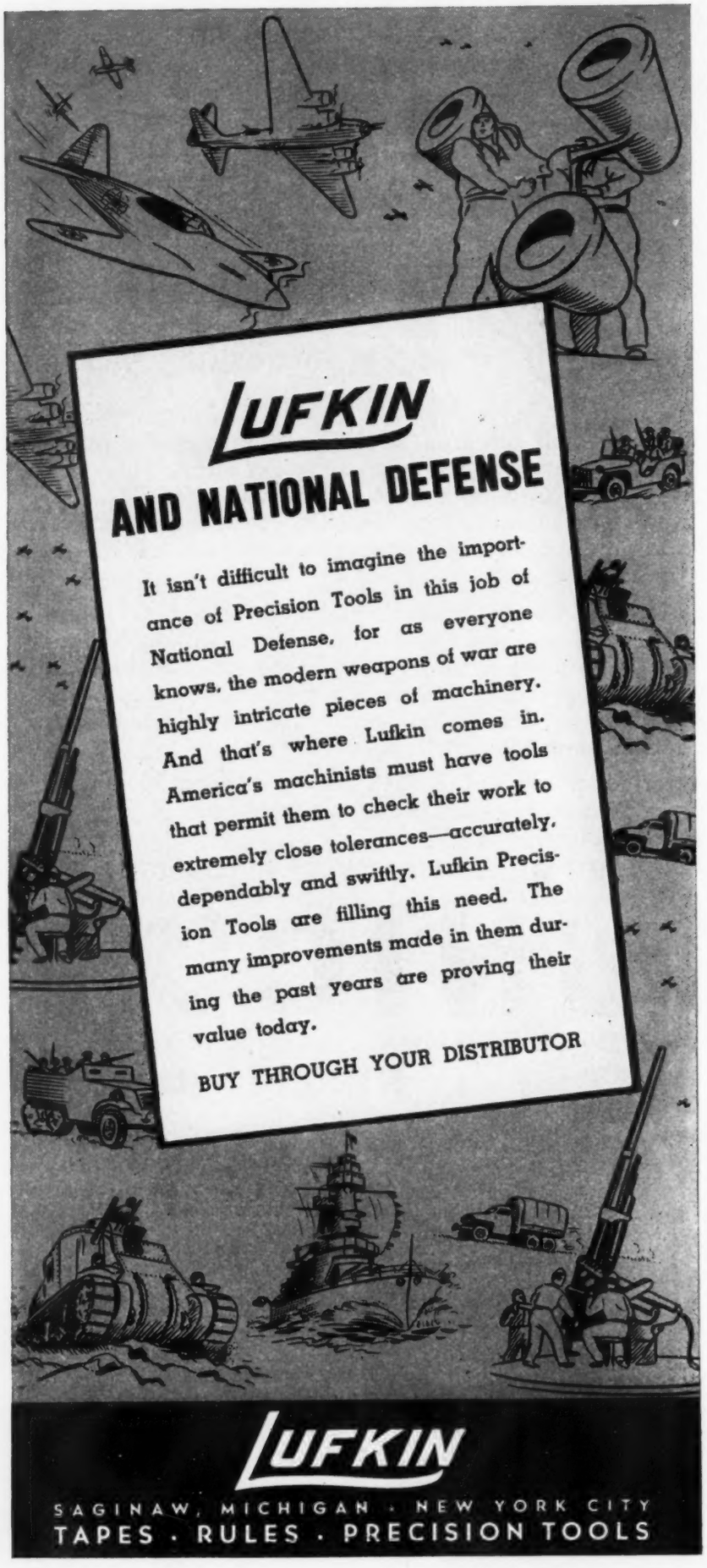
LUFKIN
AND NATIONAL DEFENSE
It isn't difficult to imagine the importance of Precision Tools in this job of National Defense, for as everyone knows, the modern weapons of war are highly intricate pieces of machinery. And that's where Lufkin comes in. America's machinists must have tools that permit them to check their work to extremely close tolerances—accurately, dependably and swiftly. Lufkin Precision Tools are filling this need. The many improvements made in them during the past years are proving their value today.
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TAPES · RULES · PRECISION TOOLS

trances is published in a folder "Identifying Employees and Preventing Unauthorized Entry," published by Perey Turnstiles Co., 101 Park Ave., New York, N. Y. Also being circulated by Perey is booklet of questions and answers about tightening up industrial plant gate guarding.

ENGRAVING H. P. Preis Engraving Machine Co., 155 Summit St., Newark, N. J., have issued a six-page folder on engraving, marking and etching machines.

FINISHES Roxalin Flexible Lacquer Co., Box 511, Elizabeth, N. J., has published a convenient file folder "Facts About U. S. Government Finishes." Data sheets cover army and navy specification finishes and tells how and where they are applied.

FLOW CONTROL Bulletin No. 40-22 about flow control and overload relief valves with automatic pressure compensator and overload pressure relief adjustment for accurate hydraulic volume has been issued by Vickers Inc., 1400 Oakman Blvd., Detroit, Mich.

FRACTIONAL HORSEPOWER MOTORS Publication GEA-3685 of the General Electric Co., Schenectady, N. Y., describes fractional horsepower motors, designed for tough jobs encountered by machine tool builders and machine tool users, as well as for other heavy-duty industrial applications.

FURNACE ATMOSPHERES Bulletin No. 92-4, published by the Brown Instrument Co., Wayne and Robert Aves., Philadelphia, Pa., describes measurement and control of furnace atmospheres used for reheating and heat-treating ferrous and non-ferrous metals.

GEAR LAPPING How lapping provides a final correction for heat-treat distortion and grinding roughness on gears is described by the National Broach & Machine Co., 5600 St. Jean, Detroit, Mich. in a four-page folder.

GEAR METAL Use of aluminum bronze alloys for gear service is outlined in a folder published by Ampco Metal, Inc., Milwaukee, Wis.

HEAT-TREATING STEEL Box type electric furnaces for heat-treating steel without decarburization are described in Publication GEA-3596 issued by the General Electric Co., Schenectady, N. Y. Outline drawings of four models are included.

INFRA-RED HEATING Three lines of infra-red heating equipment are included in a folder announced by the C. M. Hall Lamp Co., 1035 E. Hancock Ave., Detroit, Mich.

INSPECTION An illuminated magnifier which plugs into the standard 110 volt circuit has been described in a four-page bulletin recently put out by

the George Scherr Co., 128 Lafayette St., New York, N. Y.

LIGHT ABRASIVES Weldon Roberts Rubber Co., Newark, N. J., has issued a catalog and descriptive leaflet about soft rubber light abrasives for prepolishing, polishing and finishing metals.

MALLEABLE ANNEALING The Bristol Co., Waterbury, Conn., has prepared a description of an automatic heating cycle control system for operation of furnaces for annealing malleable iron castings.

MEASURING TOOLS A 68-page catalog on precision measuring tools has been issued by the Van Keuren Co., 176 Waltham St., Watertown, Mass. Sections are included on how to measure threads, worms, gears, splines and angles.

OIL FIRED HEATERS Typical applications of direct-fired oil heaters in heat-treating equipment are illustrated in Bulletin No. 73, recently published by Despatch Oven Co., Minneapolis, Minn. Thirteen features along with specifications of these heaters are listed.

PRECISION MILLER Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Calif., published a bulletin describing a horizontal precision milling machine.

PRODUCT INDEX The Bristol Co., Waterbury, Conn., has published a bulletin containing a condensed index of manufactured products and engineering services offered to industry.

PROPER LUBRICATION A folder describing how manufacturers can assure proper lubrication of machinery they make by the users has been prepared by the Lubriplate Div., Fiske Bros. Refining Co., Newark, N. J.

SELF-LUBRICATING BEARINGS Johnson Bronze Co., New Castle, Pa., is circulating its latest catalog, No. L-3, of self-lubricating bronze bushings and bearings.

SHAPERS Two folders—one on a 12-in. back-geared shaper, the other on an 11-in. shaper—have been published by Machinery Mfg. Co., 1915 E. 51 St., Vernon, Los Angeles, Calif.

SYNTHETIC RUBBER History of the development of synthetic rubber is reviewed in a folder being circulated by the Rubber Chemicals Division, E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.

TOOLING TIPS The Delta Mfg. Co., Milwaukee, Wis., has published the first issue of a regular series of folders entitled "Tooling Tips."

TRANSFORMERS Answers to typical questions about air-cooled trans-

"I WANT THE BEST POSSIBLE JOB— I MUST HAVE A GOOD OIL!!"

"THAT'S WHY I CALLED THE CITIES SERVICE LUBRICATION MAN IN" SAYS A. E. DAVEY, PRESIDENT OF ALLOY STEEL GEAR AND PINION COMPANY OF CHICAGO.

"I'm doing a job here that must be perfect when it leaves the shop. The people who get the gears are plenty critical." These are the words of A. E. Davey, president of the Alloy Steel Gear and Pinion Company.

He says further, "I don't know everything about oil. That is why I called in the Cities Service Lubrication man. I expect him to work with my men to see that they get the lubricant best suited for the job."

A. E. Davey

Much work in this shop must meet rigid government inspection. All machines, including Gleason, Fellows Gear Shapers, Lee Bradner and Browne & Sharpe machines, are operated with Cities Service Lubricants. You, too, will find these high-quality fluids capable of doing the kind of work your customers want.

Call us in for consultation—there is no charge for the service. Write us on your letterhead or mail the coupon for a copy of our booklet, 'Metal Cutting Lubrication.'

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Please send me a copy of your booklet, "Metal Cutting Lubrication." A. M.

Name.....

Firm Name.....

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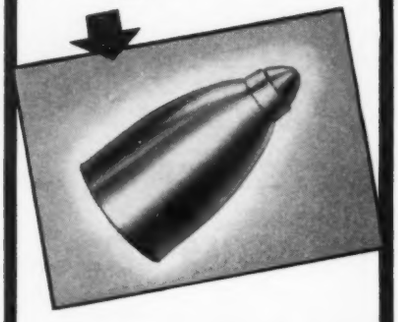
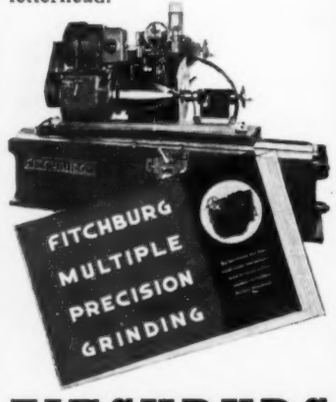
Grinding jobs like this



FITCHBURG GIVES YOU SAVINGS IMPOSSIBLE

with standard grinders

In fact it would be extremely difficult to grind Tube Piercing plugs like this to close dimensions with fine finish on any standard grinder. The special Fitchburg equipment shown below utilizes a master former, against which is held, hydraulically, a standard Bowgage Wheelhead Unit. Such standard units are easily adaptable to other work if operations change, and the Bowgage principle gives increased precision control on all work. Details are worth knowing and they're explained in new illustrated book — free to executives. Write for it on your business letterhead.



FITCHBURG

GRINDING MACHINE CORP.

FALULAH ROAD, FITCHBURG, MASS.

formers for factories, mines and central stations are given in a ten-page booklet announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Comparison of air-cooled and liquid filled units also is included in booklet No. B-2304.

TOOLS A line of standard carbibe cutting tools available in 92 shapes and sizes are covered in a four page bulletin which was recently released by Tungsten Carbide Tool Co., Detroit, Mich. Tools included are for steel, cast iron and non-ferrous metals.

TUBE DATA Technical data card No. 102-B listing latest creep-stress data on tubular materials for hard temperature service has been issued by the Babcock & Wilcox Tube Co., Beaver Falls, Pa.

TUBING PROPERTIES The Babcock & Wilcox Tube Co., Beaver Falls, Pa., has completely revised and enlarged its practical bulletin on "Properties of Carbon and Alloy Steel Tubing for High Temperature — High Pressure Service." New sections cover rupture testing, maximum allowable working stresses, steel for sub-zero application, effect of hydrogen, and air-hardening properties. A fully illustrated section on common causes of tube failure is included.

WRENCH GUIDE Blackhawk Mfg. Co., Milwaukee, Wis., has issued a 48-page wrench guide and catalog.

NEW BOOKS

COLLECTIVE WAGE DETERMINATION—*By Z. Clark Dickinson, professor of economics, University of Michigan.* 640 *pages. Published by the Ronald Press Company,* 15 *E. 26th St., New York.* $5.00

Wage rates are a national problem. In the recent past, disputes arising from them have caused disruption to our preparation for war. Obviously the problem must be treated realistically and equitably if settlements are to be made that are fair to labor, to industry and to the public at large.

There has been a marked trend toward the determination of wage levels by fewer and larger groups. As the size of the group has grown, so public interest has been more directly affected. Such factors as cost inflation and anti-social restrictions are directly involved. Monopolistic practices that promote uneconomic high-wage levels for the insiders are as much to be deplored as exploitation that handicaps living standards.

Professor Dickinson's volume is designed to give a proper perspective to the subject, both for industry and labor. In it the author describes economic theories of wage payment and principles of wage determination. He also describes agencies, both public and private, that have a direct concern in the subject. At this time when work interruption for any cause whatever is tragic, this constructive handling of the subject should prove helpful.

•

MACHINE SHOP THEORY AND PRACTICE—*By Albert M. Wagener, instructor, Henry Ford Trade School, and Harlan O. Arthur, head of department, shop mathematics, Ford Motor Company Apprentice and Engineering Schools.* 306 *pages. Published by D. Van Nostrand Company,* 250 *Fourth Ave., New York. Paper*-$1.60. *Cloth*-$2.28.

As long as the man-power of the nation must be devoted to winning the war, the necessity for intensive worker training will continue. Books prepared specifically for this purpose have the merit of avoiding the detail and the theoretic considerations that are included in some of the texts designed primarily for high school or college use.

The volume under discussion is written specifically to meet the needs of beginners in the study of machine tools and their operations. Apprentices, vocational and trade school students, and other young men currently being trained for active participation in industrial production must have the essential facts simply and graphically presented.

From their 25 years in practicing and teaching machine tool operation, the authors have prepared a volume which takes up in logical order the various standard machine tools. They include also chapters on the use of precision and semi-precision tools as well as the so-called bench and small hand tools.

Standard operations on toolroom machines are discussed in some detail. The volume is well illustrated with photographs and sketches.

•

EYE HAZARDS IN INDUSTRY—*By Louis Resnick.* 321 *pages. Published by Columbia University Press,* 2960 *Broadway, New York.* $3.50.

That good eyesight is the most vital asset of industrial workers goes without saying. Many organizations have devoted themselves to the conservation of the vision of American workmen, but there is still much to be done.

This volume is sponsored by the National Society for the Prevention of Blindness. The author has done a great deal of work in this field, going into industrial shops of all kinds to make first-hand observations and supplementing this experience by visits to European countries to learn of their treatment of this problem.

He treats the subject in two parts: (1) the problem, and (2) the solution. In the first he discusses the causes of eye injury, by accident and by disease,

and also the extent of defective vision. In his chapters on the solution, he describes methods of accident prevention, such as mechanical guards, revision of processes and improved lighting, together with employee education and administrative supervision.

The volume is no mere academic treatment of the subject, but one that will serve as a handbook for safety engineers, safety inspectors and others engaged in accident prevention.

Industrial "Paydirt"

Reclamation departments pan "paydirt" from the factory floor. For proof of this, look what the Caterpillar Tractor Company is doing.

Reclamation bins are located strategically throughout the plant to eliminate extra handling of material to be salvaged or reclaimed, including metals, steel clippings, cropped ends and trim of metal stampings, aluminum borings, steel turnings, gray iron borings, used machinery, tools, obsolete jigs and fixtures, cables, screws, grinding wheels, files, building material, crates, lumber, wood scrap, corrugated paper and discarded paper of all kinds. The reclamation department can scrap, destroy, sell, give away or prepare material for reuse, and always tries to secure the greatest value for every item.

Cutting tools, grinding wheels, jigs and fixtures which have been worn out, broken or become obsolete either through use or engineering changes, are sent to a central tool reclamation crib. Drills, reamers, broach bars and sections, milling cutters and form tools are inspected and compared with a complete cross file of tool prints. These prints are used to determine the size to which these small tools can be reground. Over 70,000 tool drawings were reviewed in the course of compiling information for this file. Plug gages are reground to progressively smaller sizes and put back into service. Worn out files are sent back to the manufacturer and resharpened—Caterpillar reclaimed 16,000 last year. Special socket wrenches and tap drivers from assembly lines, when turned in for new equipment, are inspected for tool failure and possible replacement. Approximately 30 percent of these tools were repaired by the manufacturer at ten percent of the new tool cost.

A study of grinding wheels has led to new uses for wheels after they are taken off the machine for which they were originally purchased. Arbor holes have been standardized, and the same wheel can be used on as many as three different machines. Caterpillar also uses sectional-bond cup wheels. When the cup, which is of one bond and grain size has been worn out, it is recut to the back, making a flat wheel.

More than 2,000 jigs and fixtures, which had been replaced or scrapped yearly, are now dismantled. Parts having a value that can be reclaimed economically are stored for future use or

The attention of industry is being called emphatically to the urgent need for accurate and rapid inspection at tolerances never before encountered in a period of rapidly expanding production.

In order to handle this tremendous volume of gaging operations with the highest degree of precision, gages such as the Sheffield Visual Gage are absolutely essential. The Visual Gage is highly sensitive, instantaneous in its action and deadly accurate (checking to thousandths, "tenths" and millionths of an inch). It is used for checking dimensions of manufactured and purchased parts, tools, production and master gages.

At the same time it is very simple in construction, can be handled easily by anyone familiar with inspection work, and is extremely durable.

The Reed Mechanism (the heart of the Visual Gage) is positive in action and entirely free from the limitations of frictional wear. It contains no gears, knife edges or rubbing contacts—nothing to wear out of adjustment. Measurements by the Visual Gage are always consistent and thoroughly reliable. It is one of the most efficient instruments available to inspection.

Write for details

THE SHEFFIELD CORPORATION
Gage Division · DAYTON, OHIO, U.S.A.

SHEFFIELD MASTER GAGEMAKERS

MODERNIZE with DoAll Band Files

★ **Out with slow hand filing!**

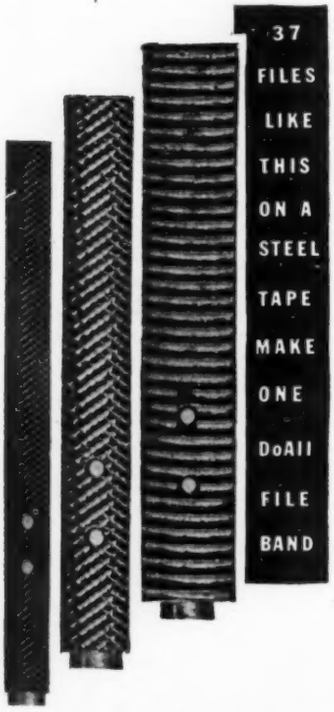
DoAlls are 8 times as fast.

★ **Away with jig filing!**

DoAlls are 5 times as fast.

That's absolutely true—and they last twice as long as ordinary files because there is no back stroking. A rigid, continuous file flows smoothly and evenly in one direction only, turning out finished jobs with amazing ease and speed.

SEE HOW DoAll File Bands WORK



Don't wait! Keep up with today's fast moving pace. Investigate DoAll Band Files right now. Send for literature today.

MANY SIZES and STYLES

DoAlls come in 20 different styles, cuts and widths, to take care of every kind of filing job, from hardest high carbon steel to brass, plastics, etc.

THE DOALL COMPANY

1210 Thacker St., Des Plaines, Ill.

Associated with Continental Machines, Inc., Minneapolis, Minn.

returned to storerooms. These items include die sets, standard jig bases, clamps and other component parts.

Here is an excellent example of cutting tool reclamation: a special cutter used on a continuous feed drum-type milling machine for milling the roller and shoe surfaces of a tractor track link was, when new, 5½ in. outside diameter and 2¼ in. thick. Originally, including one recut which is possible, an operator produced 75 to 80 pairs of links per grind, and the tool was good for about 3,600 pairs. The cutter was redesigned so that three recuts are now possible and the tool is not discarded until it is 4¼ in. outside diameter, and 1½ in. thick. The operator now gets 225 to 250 pairs of links per grind, and the tool is good for 18,000 pairs.

All sheet metal of 12-gage and lighter, with no potential use except scrap, is compressed into bales for foundry use along with skeleton stock, wire, nails, slugs, stringers, rusty barrel hoops and other items known to the industry as "hair." Usable crop ends of sheet metal are trimmed to standard widths and sizes on squaring shears. This material is then classified according to size for the production of smaller parts. Last year 1,167 different kinds of parts totalling 1,432,828 pieces were made from scrap crop ends, slugs and trims.

Caterpillar formed its reclamation department four years ago, and today has a full-time force of 50 men salvaging and reclaiming all types of equipment and material. Everybody at the plant lends a hand. They work on the principal that a chance idea of today may become a money and material saver of tomorrow.

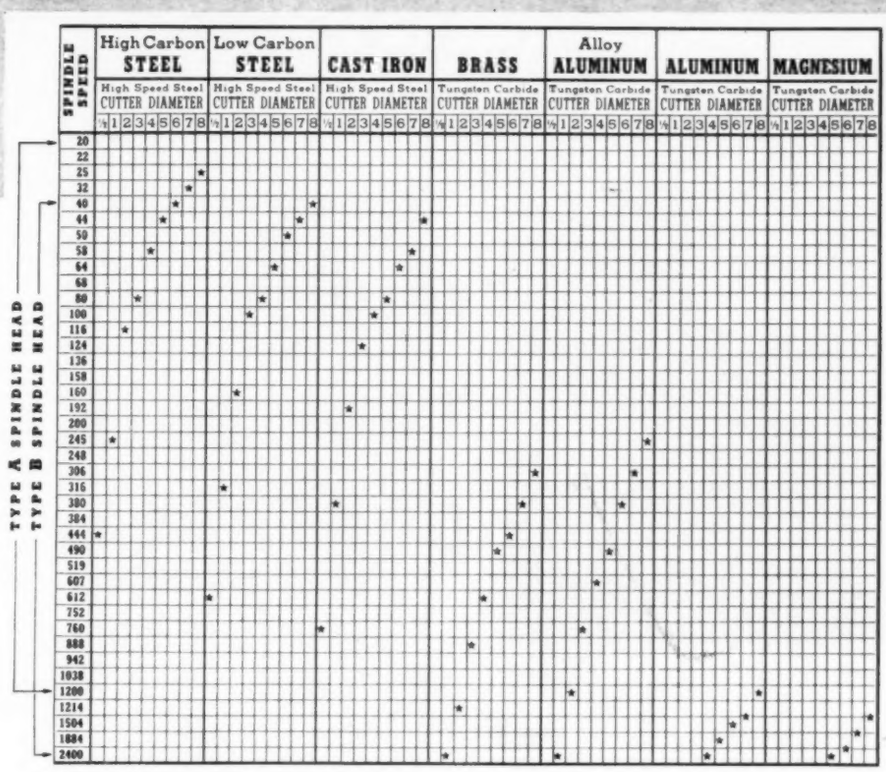
Light Paint for Machines

The recent experiments in painting parts of machines a light color to make it easier for operators recalls various similar attempts that go back for many years. The first of which we have record was in the Pittsburgh Locomotive Works where Dan Wightman, the manager, painted every machine tool white in about 1890.

Next comes the Bullock Electric Company, (which sold out to Allis-Chalmers) of Norwood, Ohio. All their machines were painted in aluminum, in about 1900. They also motorized every machine, perhaps the first shop to eliminate all belting. Of course they used their own motors.

Following the Pittsburgh Locomotive Works' precedent John Hill had all his press room machinery painted white in the early 1900's. As with all light color jobs, the oil stains messed up the really neat appearance and has always been a problem in such cases. But there is no question as to light colors being advantageous in many places. Perhaps some of our chemist friends will give us a paint which oil does not stain.

Engineered Production



No 00 Rigidmil

No. 0 Rigidmil

No. 1 Rigidmil

Note This Spindle-Speed Range!

Chart above indicates remarkable spindle-speed range of No. 1 Rigidmil. Stars show correct speeds for cutter diameters and materials named at top of columns. Note two optional ranges . . . Type A, 20 r.p.m. to 1200 r.p.m.; Type B, 40 r.p.m. to 2400 r.p.m.; with 74 changes to give you the right speed for any cutter up to 8" diameter, in any metal.

High-Ratio Heads . . . *60 to 1* is the ratio between highest and lowest speeds in Number 1 Rigidmil spindle-heads. Sundstrand exclusive design presents *unusually* high ratios, and large numbers of speed-changes, most economically in extremely practical and durable pick-off gear arrangements.

Feeds to Match . . . Sundstrand Hydraulic Equipment provides two optional *stepless* feed ranges for Number 1 Rigidmils; ½" to 31" a minute, and 1¼" to 55" a minute; in many different cycles.

Plus Values . . . With speeds for every metal, and feeds to match, Number 1 Rigidmil gives you initial production speed with economy; *easy adaptability to future requirements, long-time protection for your original investment.*

Other Rigidmils . . . Smaller and larger Rigidmils also have exclusive Sundstrand high-ratio spindle heads and hydraulic feeds; and plus values.

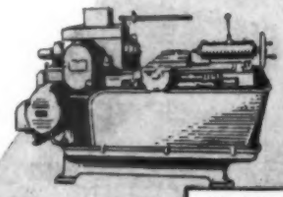
Engineered Production . . . Sundstrand Engineered Production uses all the advantages of standard Rigidmils; designs semi-standard or special Rigidmils, fixtures, and tooling for you as required . . . does likewise with Automatic Stub Lathes on turning operations. Investigate, *today*.

Enlarged copies of chart above will be mailed promptly on request. Write for your copy, today. Ask for Chart 31.

Get This Bulletin

Bulletin 383 tells all about No. 1 Rigidmil; 382 describes No. 0; others give complete details of No. 00 and the Fluid-Screw Rigidmils. Write for copies, today.

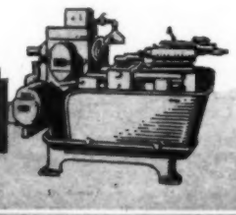
Fluid-Screw Rigidmil



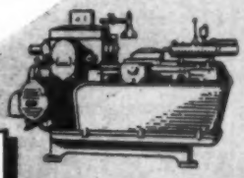
Model 12 Automatic Stub Lathe

Sundstrand Machine Tool Co.

2533 Eleventh Street, Rockford, Illinois, U. S. A.



Model 8 Automatic Stub Lathe



Model 10 Automatic Stub Lathe

In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

RIGIDMILS · STUB LATHES

Hydraulic Operating Equipment — Drilling and Centering Machines

MORE PRODUCTION with LESS TOOLS

McCASKEY TOOL CRIB CONTROL

PREVENT CRIBS FROM BECOMING PRODUCTION BOTTLENECKS

• With McCaskey Control in your cribs, you know in a moment at any time what tools are available, whether they are in the bins or have been loaned to employees. You know that those in the crib are ready for immediate use, reconditioned or sharpened if necessary—where the others are and when they were issued. The results are faster, more accurate production, fewer scrapped parts and less idle time between jobs. Instead of being a production bottleneck, the tool crib becomes a real service to production.

SKF Industries, Phila., Pa., reports —"Our records (using the McCaskey System) provide the basis for determining that the correct tool is available in good condition for each job and that it is not misused by careless workmen."

KEEP CRIB INVENTORY IN LINE WITH TOOL TURNOVER

• Numerous experiences with McCaskey Control have shown that most crib inventories can be reduced from 25 to 50%; and at the same time provide a surplus of items that are difficult to secure today. The exact requirements necessary for maximum production are easily and quickly determined from the monthly usage or turn-over of inventory tool items. Totally inactive items can be salvaged or passed on to some plant more urgently in need of them. McCaskey assures busy shops with a dependable system for keeping costs down.

A. O. Smith Corporation, Milwaukee, Wis., has the following to say about inventory reduction with McCaskey Tool Crib Control: "Four cuts in two years, totalling approximately $9,000 . . . close check on tools seems to aid in drawing out of their hiding places tools of which all trace had been lost."

• • •

Whether you have one or a dozen tool cribs, investigate the simplicity and effectiveness of McCaskey Tool Crib Control for assuring MORE PRODUCTION WITH LESS TOOLS.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

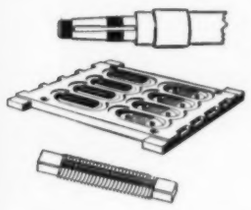
How *Chromium Plating* serves defense

TOOLS AND SALVAGE

Increases service life and results in more accurate work from a wide variety of production tools such as:—Taps, Reamers, Drills, Saws, Milling Cutters, Gauges, Drawing Dies, Mandrels, Files, etc.

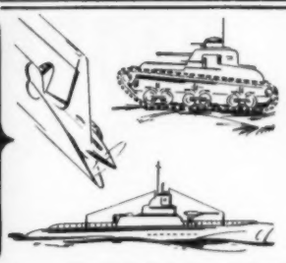
Many worn or undersized tools and parts are being salvaged by replating to size.

MACHINE PARTS AND EQUIPMENT



Reduces wear and corrosion, improves performance of essential production machine parts and equipment such as: Plastic and Rubber Molds, Cold Metal Rolls, Pump Shafts, Cylinders, Spindles, Feed Screws, Measuring Instruments, etc.

DEFENSE MATERIEL



Maintains accuracy, increases service life and improves operation of the wide variety of Defense Equipment where it is being specified.

This may be the answer to *your* problem

Hardly a day passes that does not bring with it some change in the status of metal finishing. New shortages of essential materials. New limitations on non-defense plating. Yes, and new opportunities of plating for defense.

Chromium plating is undoubtedly the most important plated finish in the defense program. It is being used more widely than ever before on gauges, tools and other production parts as well as on the new applications created by the Defense Program.

And it is being used by many companies that are not set up for plating—but place their order with plants that are—and accompany these orders with a preference rating or allocation for material.

For many plants then, here is one answer to today's problem—convert at least a part of your plating facilities to defense work.

That is how United Chromium believes it can be of real assistance. In serving hundreds of licensees, many of whose facilities are devoted 100% to defense work, United Chromium assists in:—

1—Adapting plating programs to the requirements of industrial or "hard" chromium plating.

2—Plating the new or unfamiliar parts peculiar to defense needs.

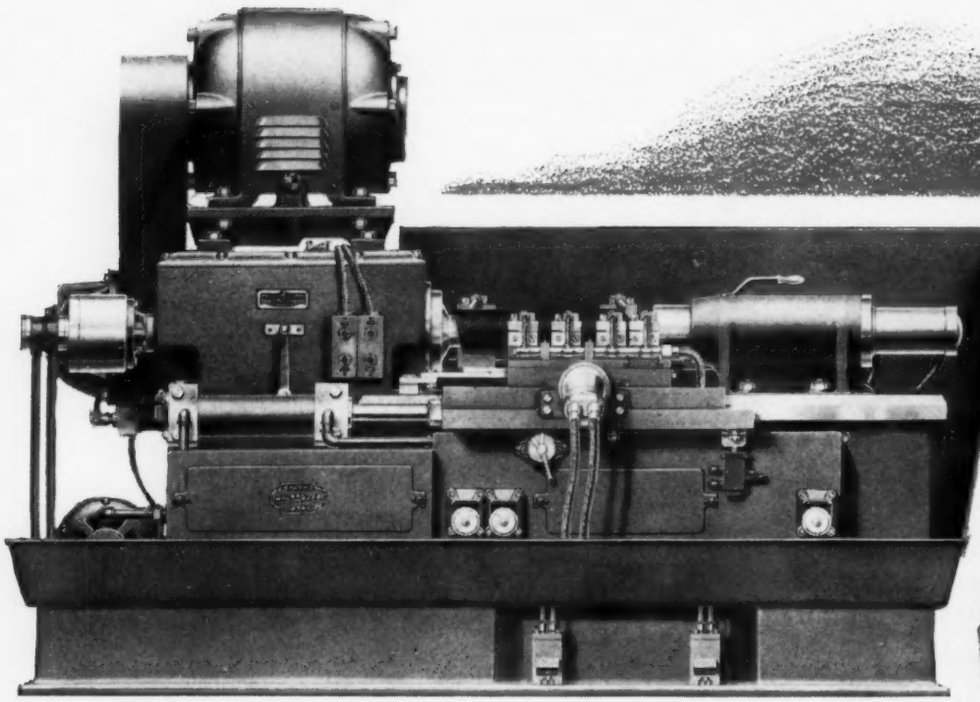
3—Meeting the specifications called for in Army and Navy work.

4—Carrying on non-defense finishing operations—in compliance with government orders and regulations.

We will be glad to assist in determining whether your present equipment can be utilized in plating some of the applications outlined above.

UNITED CHROMIUM
INCORPORATED

51 East 42nd Street, New York, N.Y.
2751 E. Jefferson Ave., Detroit, Mich.
Waterbury, Conn.



SPARKS *Semi-Automatic* HYDRA-FEED LATHE

. . . for rough and finish work on SHELLS *from 75 M/M to 155 M/M*

Designed for SPEED *and* ACCURACY

Shell bodies and work similar in shape can be rough and finish machined at high speed to close limits on this new SPARKS machine. It is sturdy in design and amply powered for long hard service and maintained accuracy. Hydraulic feed as well as hydraulically operated brake and clutch provide automatic operation.

WORK IS EASILY HANDLED

. . . shell forging is inserted in lathe, tail stock live spindle traversed hydraulically to located shell on mandrel when spindle starts automatically through hydraulically operated clutch.

. . . carriage with slide controlled tools is moved hydrically until outside of shell is completely turned; simultaneously, rear slide tools are moved hydraulically into shell for facing base and cutting off open end to length.

. . . on completion of turning, pilot valve is rotated automatically by trip dog which puts feeds in rapid traverse to return carriage and rear slide to starting positions.

. . . spindle is stopped automatically by hydraulically operated brake.

. . . pressure is released on expanding mandrel and traverse tailstock spindle by foot-operated valve on floor to permit quick recovery of turned shell.

CONDENSED FEATURES AND SPECIFICATIONS

Geared Head Stock—4 speeds.

Hollow forged steel ground spindle mounted on Double Row Timken Bearings.

Tool carriage heavily ribbed.

Longitudinal and cross feeds quickly changed by feed dials.

Main Motor drive through V-belt or silent chain.

Swing over ways: 19" Swing over carriage: 10".

WRITE AT ONCE FOR FURTHER DETAILS

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

Sellers

Horizontals at Work—

1. 5" Sellers Floor Type Horizontal boring and facing large marine cylinder and valve chest.
2. 6" Sellers Table Type Horizontal profiling on automotive die work.
3. 5" Sellers Table Type Horizontal tapping stud holes in gear case.
4. 9" Sellers Floor Type Horizontal milling on low pressure turbine work.
5. 5" Sellers Floor Type Horizontal milling part of gun carriage.

WILLIAM SELLERS & CO., INCORPORATED
1612 Hamilton Street • Philadelphia, Penna.

There's the STAINLESS STEEL WELDING ELECTRODE YOU WANT"

• It's listed on page 6 of this booklet on Stainless Steel Welding and Electrodes that has been prepared by PAGE.

•

You probably know as well as we do that you must look for and insist on getting two distinctly different *kinds* of quality in your Stainless Steel Electrodes.

It is imperative for good Stainless Steel Welding that the deposit *in the weld* be equal to the Stainless Steel you are welding.

It is just as important that the electrode be of the shield-arc type, to protect the metal in the weld; equally usable in horizontal, vertical and overhead positions; permit high speed welding with minimum spatter and slag loss and smooth beads.

To get all those qualities for you, PAGE worked in the field and laboratory with the world's largest producers of Stainless Steel —until they said every PAGE Stainless Electrode was *right*.

Start right, then, with your Stainless welding. Depend on PAGE. Tell your local PAGE Distributor the Stainless Steel you want to weld and accept his recommendation.

Be sure to ask your local PAGE Distributor for a copy of this valuable, well illustrated booklet on the welding of Stainless Steels. It covers the entire subject.

PAGE WELDING ELECTRODES

PAGE STEEL AND WIRE DIVISION • MONESSEN, PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.

Save precious seconds in production with

DISSTON

SAWS and FILES

You can speed up hand or machine cutting of metals by using Disston Hack Saw Blades . . . proved faster and more durable in actual shop tests. Use Disston Di-Mol Hack Saw Blades for general work; they keep their keen edge when other blades break teeth and fail. For cutting stainless steel and other tough alloy steels, you'll save a lot of time by standardizing on Disston High Speed Steel Hack Saw Blades.

When you want added speed and precision use Disston Hard Edge, Flexible Back, Metal Cutting Band Saws. They, and Disston Metal Cutting Circular Saws, are "tops" for cutting fast and clean through a wide range of ferrous and non-ferrous metals.

Gain additional seconds in metal finishing operations by using Disston Bite-Rite Files. They take off more metal with each stroke, leveling and smoothing as they cut . . . filing faster and more evenly.

Disston Engineering Service is yours for the asking . . . a simple way to get the utmost from your saws, files and other tools. Write for details to Henry Disston & Sons, Inc., Philadelphia, Pa., U.S.A.

MULTIPLE THREAD MILLING CUTTERS

Maintained accuracy... *and better threads– by finishing after hardening . . . .*

These important members of the complete H-W line of Precision Tools meet urgent demands for utmost accuracy in thread production by the milling method. They assist modern thread milling machines to produce at maximum capacity and at minimum cost per thread.

By finishing Hanson-Whitney Milling Cutters all over after hardening—a precision production process which distinguishes all H-W tools—angle of thread, relief and spacing of threads are controlled to exact specifications.

In H-W Thread Milling Cutters, teeth can be spaced minus or plus to compensate for any possible variations that might occur in hardening — a valuable feature especially in the milling of thread rolling dies. By spacing teeth minus, it is possible to compensate for helix angle of thread.

also

TAPS
GAGES
HOBS
PRECISION SCREWS
WORMS
MACHINE TOOLS

THE HANSON-WHITNEY MACHINE CO.
HARTFORD **CONNECTICUT**

DOMESTIC REPRESENTATIVES

MACHINERY and SMALL TOOLS—New York, L. C. Biglow & Co., Inc.; Rochester, A. G. Brice; Pittsburgh, William K. Stamets; Detroit, Nelson Sherburne, Jr.; Los Angeles, A. C. Behringer; St. Louis, W. H. Scheer.

MACHINERY ONLY—Philadelphia, Lloyd & Arms, Inc.; Cleveland, William K. Stamets; Chicago, Marshall & Huschart Machinery Co.; Dayton, Seifreat-Elstad Machinery Co.; Cincinnati, Seifreat-Elstad Machinery Co.

SMALL TOOLS ONLY—Philadelphia, General Tool Sales Co.; Cleveland, George A. Whalon; Chicago, M. Ray Pearce; Dayton, George Langen, Jr.; Cincinnati, George Langen, Jr.

BATCH TYPE CONVECTION FURNACES ARE A "NATURAL" FOR THE ANNEALING OF

CARTRIDGE CASES

● For annealing cartridge cases there are many instances where conditions are such that the Surface Combustion Batch Type Convection Furnace is a "natural".

Such was the case in the installation shown below. Revere Copper & Brass Incorporated of Chicago was called upon to manufacture 105 mm. cartridge cases. A continuous convection type furnace was considered for the process anneals but batch furnaces were finally selected. Revere Copper & Brass decided that for their production and over-all set up, batch furnaces were more economical and flexible than a single continuous convection furnace of equivalent capacity.

These three batch furnaces are used for the four process anneals at a temperature of 1150°F. A fourth batch type furnace (not shown) is used for the final stress relief anneal at 500° F.

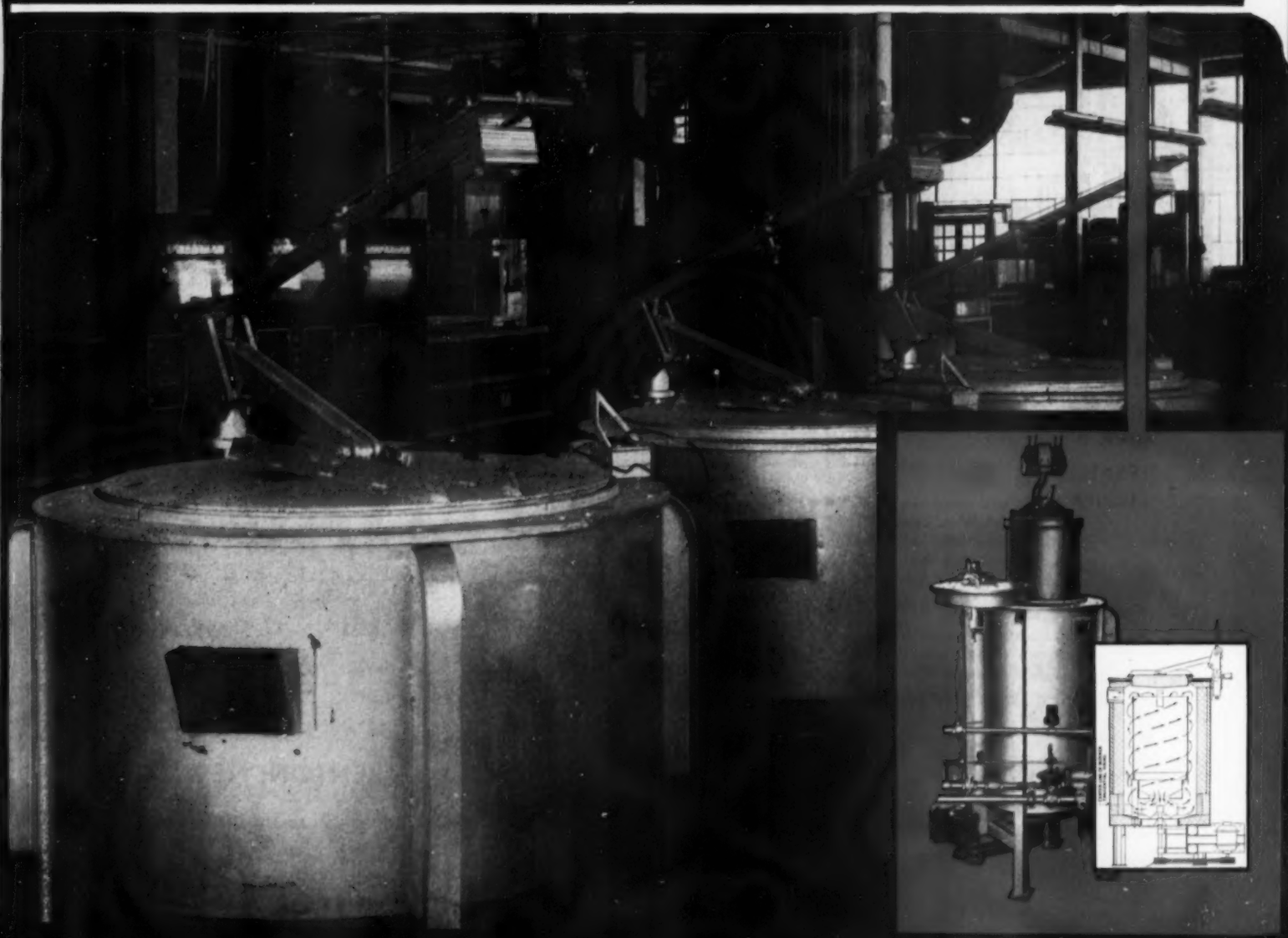
Surface Combustion has available a wide selection of established designs in both batch and continuous type convection furnaces. Our engineers will be glad to analyze your production requirements and plant layout to make recommendations for the most advantageous type of furnace to suit your needs.

SURFACE COMBUSTION CORPORATION · TOLEDO, OHIO

SECURITY FOR AMERICA

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES · JANITROL GAS-FIRED SPACE HEATING EQUIPMENT · AND KATHABAR AIR CONDITIONING SYSTEMS



We'll gladly try to help you *find the answer!*

ROUND HIGH AND LOW CARBON COMMON AND SPECIALTY WIRES

Hard Drawn, Soft Annealed or Tempered, in all Finishes—Bright, liquor Finish, Coppered, Tinned, Galvanized.

Specialties: Aircraft Wires, Armature Binding Wire, Bookbinders Wire, Florists Wire, Pin Wire, Reed Wire, Shaft Wire, Spring Wires, Tire Wire, Weaving Wire, etc.

FLAT HIGH AND LOW CARBON AND SPECIALTY WIRES

Hard Rolled, Annealed, Scaleless Tempered; Tempered and Polished, Tempered, Polished and Colored; Various Finishes—Bright, Tinned, Coppered, Hot or Electro Galvanized.

Specialties: Band-Saw Steel, Bobby Pin Wire, Brush Wire, Corset Wires, Curtain Spring Steel, Heddle and Drop Wires, Heddle Bar Steel, Rule Steel, Tape-Line Steel, Box-Stay Wire, Umbrella Wires, etc.

SHAPED WIRES

Various High or Low Carbon Shaped Wires such as: Shaft Casing Wires, I Beam Sections, Space Block Wires, Square, Keystone, Oval, Half Oval, Half Round, etc.

WE HAVEN'T by any means *all* the answers to the wire supply problems of our customers. But we believe we do have a sympathetic understanding of them. And we're always ready and anxious to help find a solution.

For example, when the exact wire required is not available, sometimes we are able to suggest a satisfactory substitute that saves the day. In some instances, where our customers have been unable to complete important orders because of lack of small but essential quantities of wire, we have been able to scout around and find the wire to tide them over.

Then, too, we are *spreading* our output amongst customers to the best of our ability.

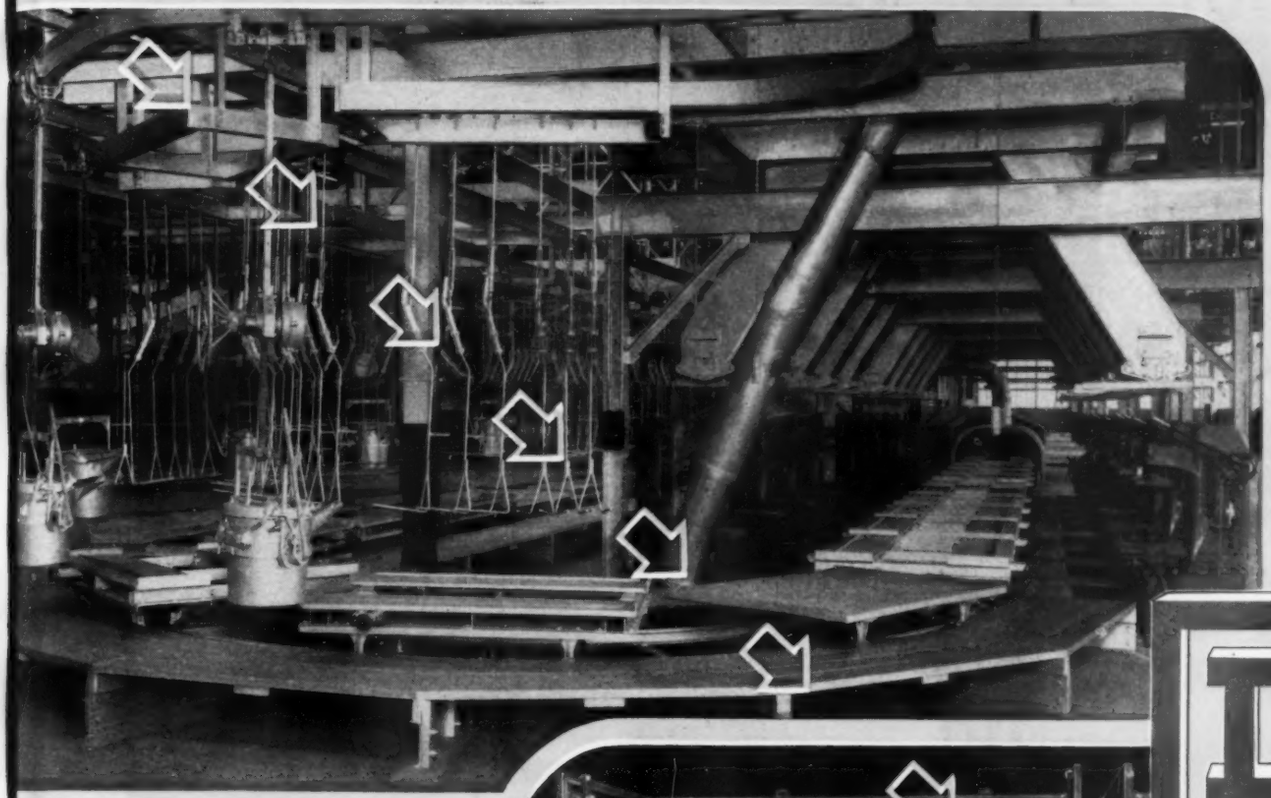
You will realize, of course, that the supply of Roebling Wires is limited—whereas the demand is abnormally great. "Business as usual" is impossible. But we want you to know that, despite this situation, we are leaving no stone unturned to serve you.

ROEBLING WIRES

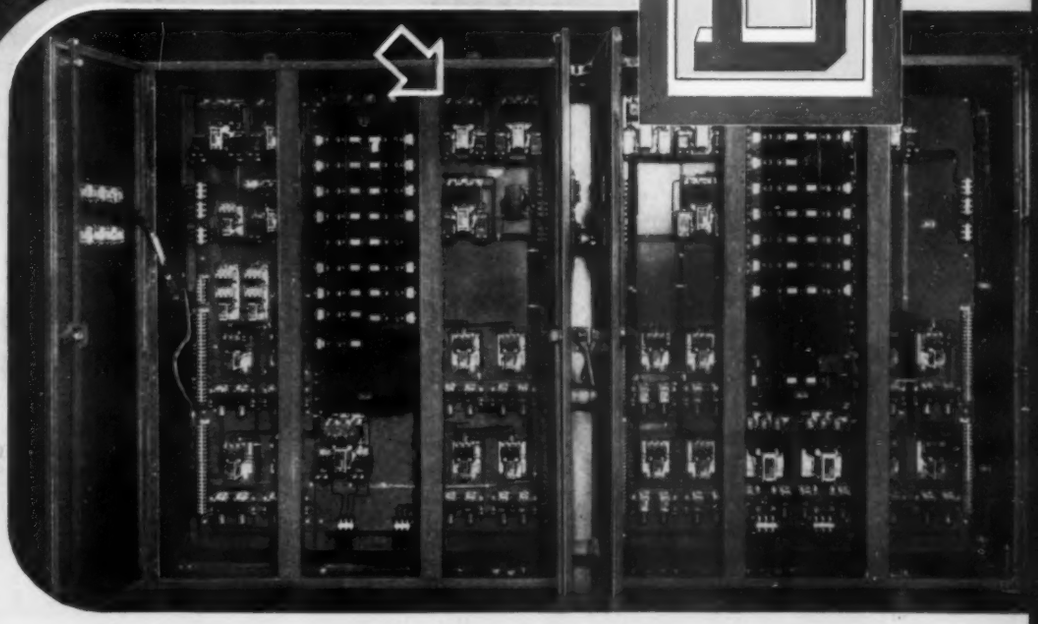
ROUND · FLAT · SPECIALTY

JOHN A. ROEBLING'S SONS COMPANY · TRENTON, NEW JERSEY

THIS FOUNDRY EQUIPPED WITH SQUARE D MOTOR CONTROL...



Above: **One of the six mechanized continuous conveyor units in the foundry of the International Harvester Company's new truck engine factory in Indianapolis.**



At Right: **The control panels are built from standard units with provision for future additions and also include circuit breaker distribution panels for motor disconnect and short circuit protection. The enclosing cabinets have vault door construction with roller operation to insure a dust-tight seal.**

● **When a foundry is completely mechanized for the production of 300 tons of castings a day, there must be no failure of the electric control system. Shutdowns would be very costly.**

Square D built the control panels and helped in the engineering of the intricate control system which plays such a major part in this highly mechanized operation. It is doing its important job — efficiently and consistently.

The Square D line of automatic motor control is complete for all industrial requirements. Square D engineering counsel and service is always available.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

TOOL LIFE GOES UP...

CHIPS DO NOT WELD

SAY machinists: "To turn out good work without sacrificing the life of your tools, the cutting oil must be *balanced* to fit the job at hand." That's the secret of the outstanding performance of Shell Lata Oils—they are *balanced:* to give improved surface finish, longer tool life, reduced tool and work temperatures, adequate lubrication at all practical cutting speeds. Result—welding of chips is prevented . . . there is less machine "down time."

• • •

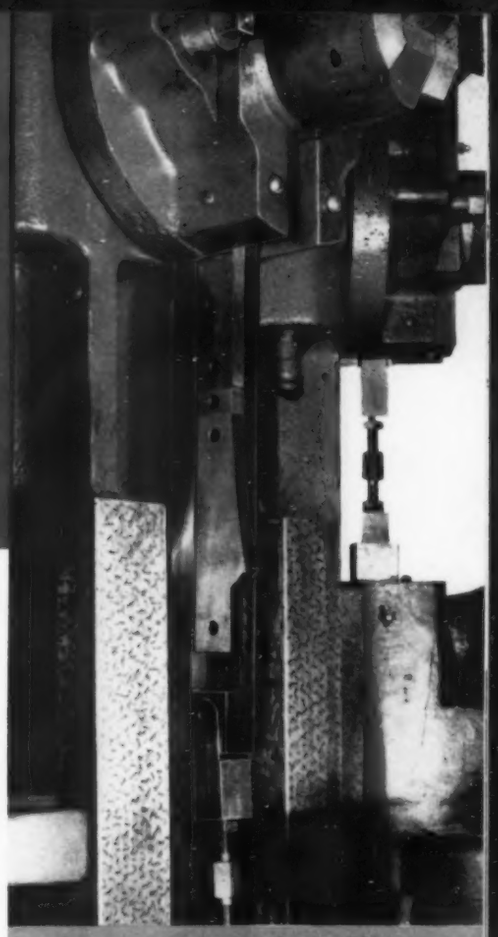
Are you sure your shops have all the advantages to be derived from the use of Shell Lata Oils? You'll find a Shell man's recommendation practical—and made without obligation. Call him in today!

. . . when you use *BALANCED*

SHELL

SHELL LATA OILS

The RIGIDTURNER



The Rotary 8-Spindle RIGIDTURNER

is particularly adapted to turning shell rapidly at low cost.

Operation is Simple

On the Rotary, like the single machine, the operator merely loads the machine, presses a button and the machine completes the work. By the time operator removes a piece and loads another the machine has completed the turning operations and indexed the finished job to the loading station for removal.

No Skilled Help Required

Because of the ease and simplicity of operation the ordinary shop mechanic can easily run the machine.

●

Made in Single Spindle

For users not set up to employ the high production 8-spindle model—the Rigidturner is available in single spindle types.

●

THE CLEVELAND HOBBING MACHINE COMPANY CLEVELAND, OHIO

FOR SHELL TURNING UP TO 105 M.M.

A specifically designed head and carbide tool is used for shell turning. The head is operated from a cam which has the shape of the shell to be turned. Duplication is positive and accurate.

HIGH PRODUCTION

For example, on 105 m.m. Shell the 8-Spindle Rotary averages over 120 pieces per hour . . . and on 75 m.m. Shell averages 185 pieces per hour.

You can get the complete RIGIDTURNER story from this booklet — write for it today.

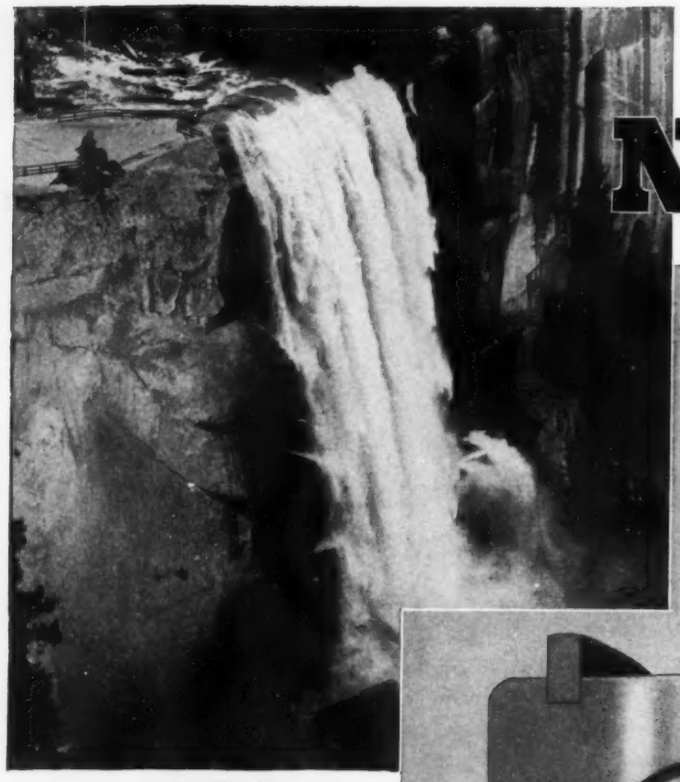
THE CLEVELAND HOBBING MACHINE CO. · CLEVELAND OHIO

NAME _____

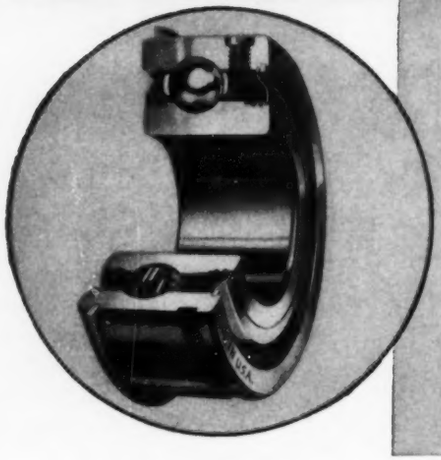
COMPANY _____

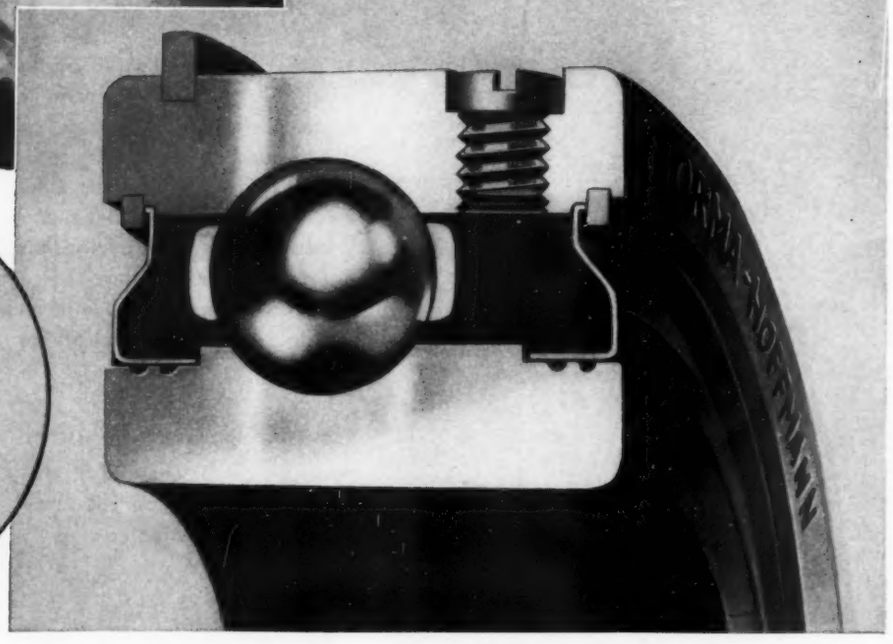
ADDRESS _____

CITY _____ STATE _____



NO *Fear of* GOING DRY!





What water means to the earth, lubricant means to a bearing — life itself. And as the mountain stream provides an abundant and constant flow of water, so the exceedingly large grease capacity of the "CARTRIDGE" BALL BEARING provides constant and abundant lubrication to its raceways and rotating elements.

In the cross-section herewith, note how the DOUBLE-ROW WIDTH GIVES THE "CARTRIDGE" BEARING DOUBLE THE GREASE CAPACITY of the single-row type — guarding against premature dryness. Note also how the in-built metal seals confine the grease WITHIN THE BEARING ITSELF, REGARDLESS OF THE ANGLE OF THE SHAFT.

The "CARTRIDGE" BALL BEARING is equipped with close-fitting, wearless metal shields which, with recessed inner ring construction and two or more grease grooves, form a truly effective labyrinth through which THE GREASE CANNOT PASS AND DIRT CANNOT ENTER.

Adopt the "CARTRIDGE BALL BEARING as your insurance against neglected lubrication, and dirt and grease contamination. It is handled as an integrally sealed unit, needing no supplementary closure parts. It provides easier and quicker assembly and disassembly. It STAYS CLEAN before mounting, during assembly, or when removed, and has convenient regreasing and inspection features.

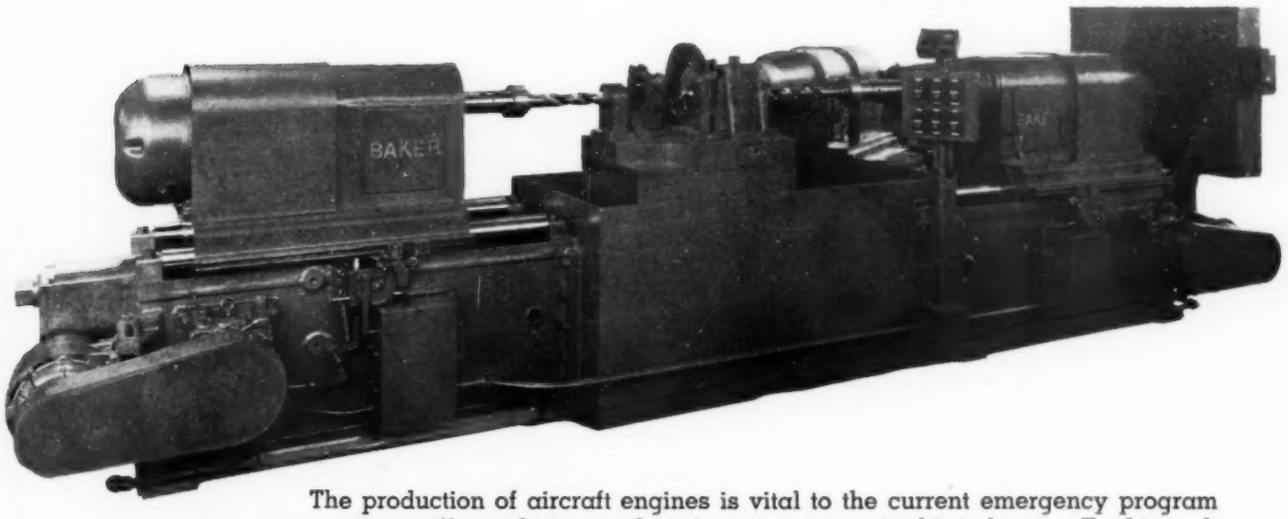
Write for the Catalog. Let our engineers work with you.

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U.S.A. • FOUNDED 1911

PRECISION BALL, ROLLER and THRUST BEARINGS

Baker Drills

. . . THIS 3½ x 16 HYDRAULIC FEED, 3-WAY HORIZONTAL UNIT, ROUGH DRILLS AIRCRAFT ENGINE CRANKSHAFT CENTER SECTIONS!



The production of aircraft engines is vital to the current emergency program . . . every effort is being made to increase output in this industry. To this end, here's a specially built job for work on aircraft engines . . . a BAKER 3½ x 16 Bar Unit Hydraulic Feed Machine. As applied to present operations, this unit represents the ultimate in high-speed, cost-reducing output. And, as an added advantage (like most BAKER units) its construction is such that, although used for special jobs today, it may be adapted for regular production runs tomorrow, with a tooling change. That's why you should see BAKER about knotty production problems. Write us, or call in a BAKER engineer . . . you'll find BAKER equipped to build a *better machine for your job!*

Examine this production data as applied to operations you might have . . .

OPERATION . . . Three way drill 2" diameter drills from solid forging.

PART . . . Crankshaft—center section—steel forging chrome nickel moly.

METHOD . . . Machine, being composed of center bed with three standard units in proper position, requires forging to be located in special fixture on center bed. Location is taken from previous turn operation, and adjusting vee jaws. Fixture is arranged with tool support bushings in brackets on fixture. Power—three 15 H. P. 1200 R. P. M. for drive to head on saddle of unit. Three 3 H. P. 1800 R. P. M. for drive to oilgear pump.

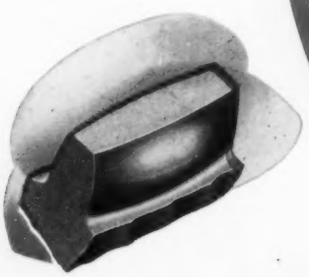
BAKER BROTHERS INC. Toledo, Ohio, U.S.A.

OUR MOTTO SINCE 1867
"MACHINES: STURDY and EFFICIENT, AS FINE AS CAN BE BUILT . . ."

DRILLING • BORING • TAPPING AND KEYSEATING MACHINES

THE Elliptoid TOOTH FORM

AN IMPORTANT ADVANCE IN GEAR PRACTICE



Gear tooth contact is one of the most important factors in gear operation, efficiency and service. In a large percentage of cases both gear failure and gear noise are the result of deflections or of slight misalignments of gear axes in either the horizontal or the vertical planes.

This trouble is completely eliminated by the use of the ELLIPTOID tooth form which has been developed by Red Ring engineers for both spur and helical gears.

A horizontal section through an accurately formed conventional tooth has sides that are straight. But with the ELLIPTOID tooth the sides are elliptical, thus making the tooth thicker at the center by .0002" than at the edges or wherever it is desired to locate the contact.

This .0002" is well within customary allowable limits for good gear practice, but by the Red Ring method this can be varied to meet various conditions.

It has been discovered that on the basis of the tooth form design in the transmission gearing of five years ago, it is now possible to reduce gear size, weight and cost for any specified loading by reducing the pitch and making the teeth in the ELLIPTOID form.

The ELLIPTOID form is produced on the Red Ring Gear Finishing Machine as part of the regular gear shaving operation. It requires no extra machine time, no special skill on the part of the operator. Write for descriptive bulletin.

NATIONAL BROACH AND MACHINE CO.

5600 ST JEAN • DETROIT MICHIGAN

RIVETT AIMS AT PERFECTION

In Performance

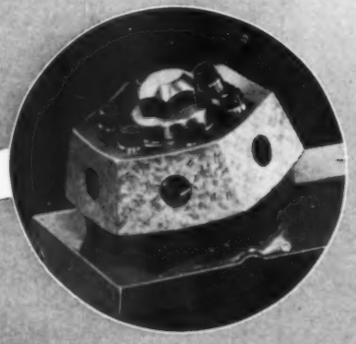
THE RIVETT HAND SCREW MACHINE reflects these objectives in production by its economy, operating convenience and precision. The value of this machine should be considered and recognized for initial and second operations on small precision work. Many jobs now produced on heavy, costlier units are more quickly set up and finished to closer limits on Rivett hand screw machines. The "critical," larger machines are thus released for more suitable work.

Send for
Bulletin 918A

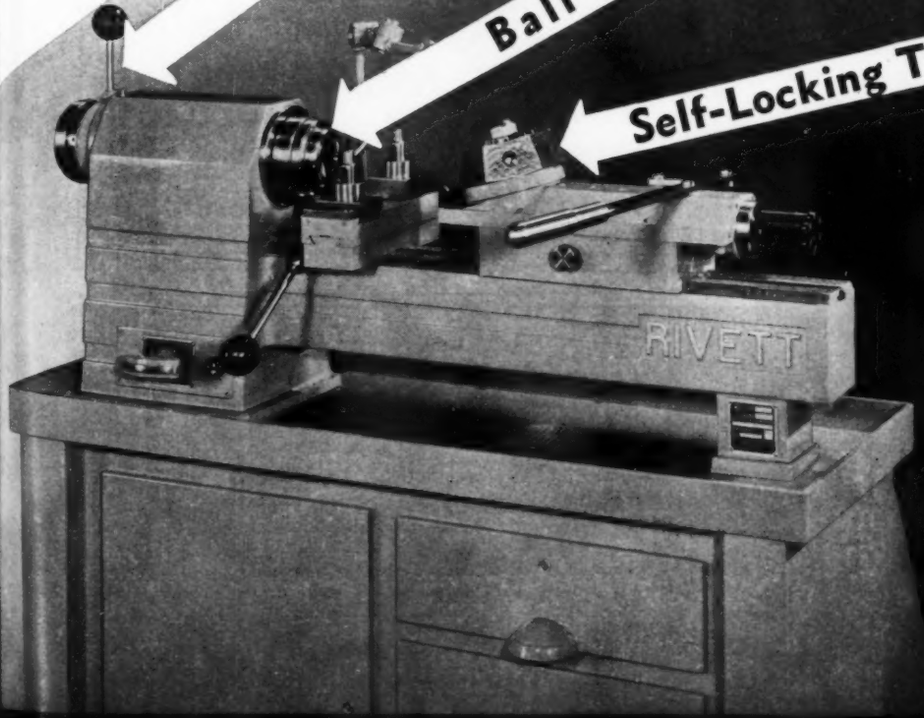
In Design

Positive Lever Chucking

Ball Bearing Spindle



Self-Locking Turret



RIVETT 918
HAND SCREW MACHINE

9" Swing over Bed
6" Capacity with Jaw Chucks
6" Capacity with Step Chucks
1" Capacity with Draw-in Collets
or
1" Capacity with Push-out Collets
8 Spindle speeds 150-2500 r.p.m.
or
8 Spindle speeds 225-3750 r.p.m.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

PIONEERS IN BENCH LATHE DEVELOPMENT

IF IT'S *Speed Reduction* ASK FOR
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Westinghouse Geared Drives

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"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS
BOSTON, MASS.
ESTABLISHED 1877 · BY GEO. B. GRANT

---a "DEGREE" in gear perfection

"Gears by Meisel" . . . These two letters signify thirty-three years of specialization in the art of gear design. They symbolize the *construction of gears for specific purposes* which, by their inherent accuracy, assure the highest possible degree of mechanical perfection. Lay your problem before a MEISEL Gearist to determine the *one* gear suited for your job.

An interesting brochure, entitled "Gear Craftsmanship," will be mailed FREE upon request.

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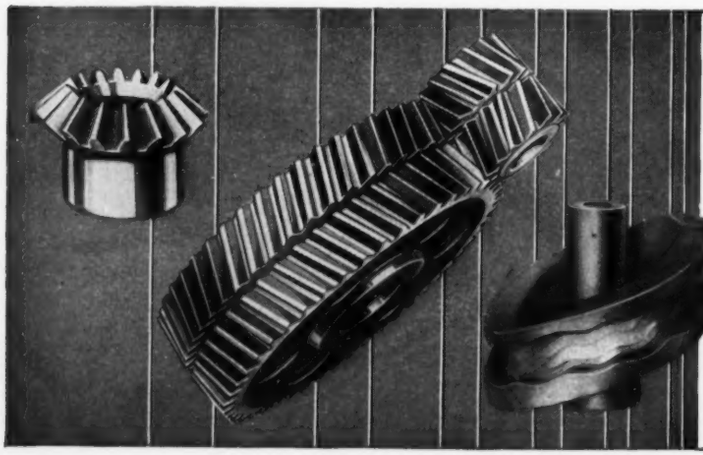
New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY



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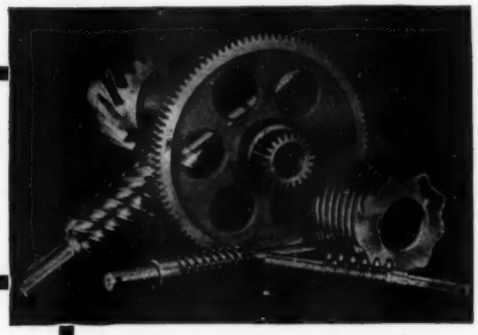
GEARS of every description cut to order
GEAR, CAM and THREAD grinding
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

PERKINS GEAR WORMS

for *Precision* requirements



You can depend on precision work to your most exacting specifications when you make Perkins responsible for the production of your worm, helical, spiral and bevel gears.

High precision and uniformly high quality are duplicated on every order for Perkins Gears regardless of the quantities involved.

As specialists in gears for precision work, Perkins offers you Custom Cut Gears that insure the utmost in efficiency, long service and economy.

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PERKINS MACHINE & GEAR CO.
110 Circuit Ave. SPRINGFIELD, MASS.

THE JOHNSON FRICTION CLUTCH

HAS FLOATING PLATES
THE NEW "MAXITORQ" MULTIPLE DISC DESIGN.

. . for maximum serviceability in minimum space

Double
Has
"Floating Plates"
in neutral

The adaptability of JOHNSON FRICTION CLUTCHES to hundreds of different kinds of machines has been possible by the compactness of these sensitive, durable units.

Many leading manufacturers of industrial machinery have standardized on JOHNSON CLUTCHES because their adoption involved minimum changes in design, and assured a maximum in clutch performance.

In addition to compactness, JOHNSON CLUTCHES offer quick, smooth starting. They are available for high speed on light powered drives and can be depended on for safety, durability and economy.

Let us show you how easy it is to engineer the JOHNSON CLUTCH into your machines. Just send us details of how you propose to apply the clutch. Ask for our assistance today.

Write for Multi-Disc Clutch Catalog No. 124 or Consult "Sweet's" or "Thomas' Reg."

Single

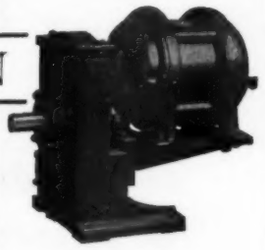
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

CULLMAN

SPEED REDUCERS

Efficient—Durable—Compact

Equipped with Timken Bearings and Helical Gears. Made in sizes for motors from ¼ to 15 hp. Ratio from 2½ to 1 to 1014 to 1.



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Lathe, Shaper and Milling Machine Drives

CULLMAN WHEEL COMPANY

1349 Altgeld St. Chicago, Illinois

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SPURS—SPIRALS—BEVELS—WORM GEARING

(14 to 96 D. P.)

With considerable experience and exceptional facilities for the manufacture of high precision Small Gears, our manufacturing capacity is now heavily burdened with National Defense work, and we naturally feel pardonable pride in the importance and quality of our contributions to the Program.

While this very essential work takes precedence, we are keenly conscious of our *duty* to *established* customers; their needs must command our continued earnest efforts. Under such circumstances, we hope new inquirers will understand our inability to give their wants the consideration they would ordinarily receive.

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FOR SIXTY YEARS

Spur—SPEED REDUCERS—Worm

ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 1007 W. Washington, Chicago

FINE GEARS of ALL Types and Sizes

Spur Gears—½ in. to 30 ft. in diameter
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Worm gears in any practical size

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EARLE GEARS

Gear Specialties

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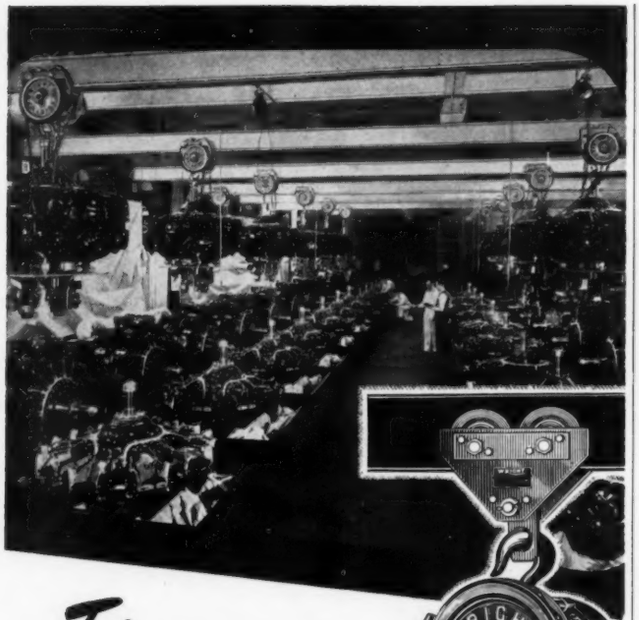


For HIGH-SPEED PRODUCTION Use WRIGHT High-Speed HOISTS

• Engineers in every industry are turning to WRIGHT for high-speed vertical and horizontal transportation. They know WRIGHT hoists are engineered for *fast*, high-speed work. They know WRIGHT hoists are built to do their work rapidly, efficiently, smoothly. They know them to be *safe* and *economical*, too.

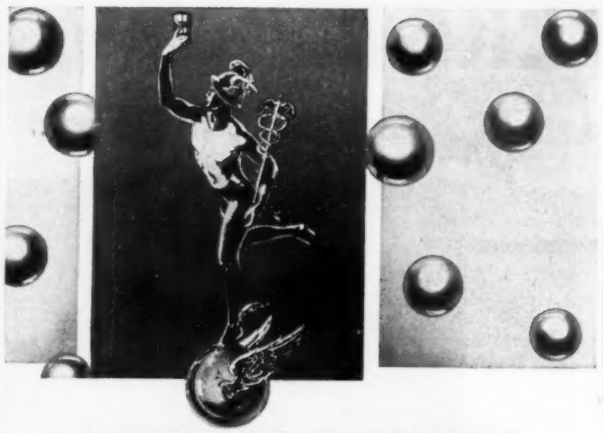
Furthermore, they know WRIGHT engineers are well qualified to give you specialized service. WRIGHT men have studied and solved hundreds of individual hoisting problems, then designed and built hoists to fit.

WRIGHT TROLLEYS are made to give the same *fast, economical, safe* service as WRIGHT hoists. Write for your copy of the new WRIGHT Catalog and learn the 21 points of WRIGHT superiority.

Let WRIGHT engineer your hoisting and crane problems. Work through the WRIGHT distributor in your city. You'll find him listed in the classified telephone book.

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.
In Business for Your Safety



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All WATERBURY STEEL BALLS are of uniform hardness which extends to the center of each ball. Made of high carbon chrome alloy steel highly finished.

WATERBURY STEEL BALLS

HIGH CARBON, CHROME ALLOY STEEL, BRONZE MONEL METAL, STAINLESS STEEL BALLS, STANDARD, OR SPECIAL SIZES. WRITE FOR COMPLETE INFORMATION.

THE WATERBURY STEEL BALL CO., INC.
Poughkeepsie, New York
Factory: Waterbury, Conn.

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for new supply sources?
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ECONOMICAL SERVICE
ALL TYPES, MATERIALS
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Spur - Helical - Bevel - Worms - Screws - Racks
Multiple Splined Shafts a Specialty

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Specially Designed for Special Duty

WE show, on this page, a variety of special bearings for coal mine conveyors, typewriters, textile winding machines, typewriter desks, etc.

These are only a few of the many hundreds of different types of "Commercial" bearings designed to reduce costs in various products and machines.

"Commercial"
ANNULAR BALL BEARINGS

We solve ball bearing problems with "Commercial" Annual Ball Bearings designed, if necessary, to meet new conditions. Many innovations in ball bearing practice have had their inception in our factory and, as a result, the demand for "Commercial" Annular Ball Bearings is constantly increasing.

Our Engineering Staff is ready to recommend installations to suit your particular requirements. Send for 1941 catalog.

THE SCHATZ MANUFACTURING CO.
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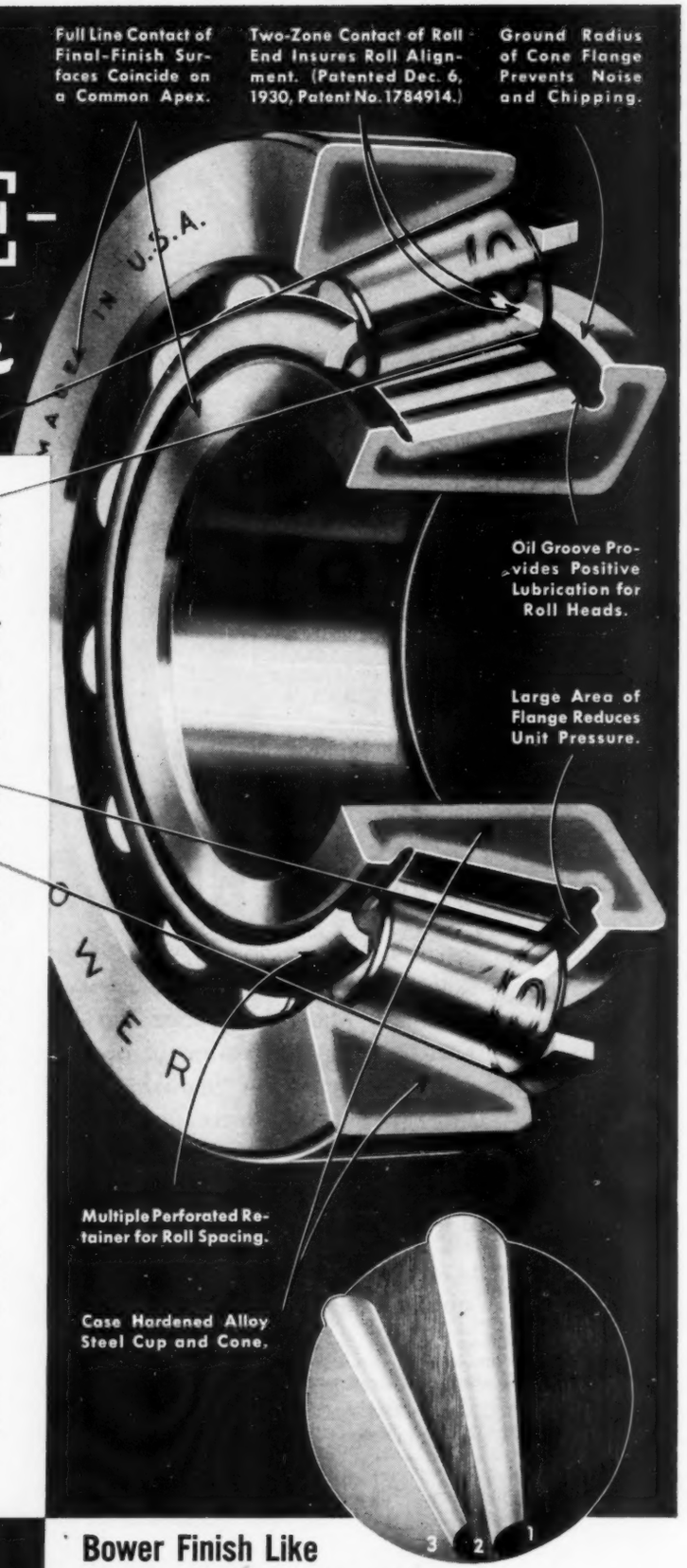
OF FIRST IMPORTANCE—

Design


Full Line Contact of Final-Finish Surfaces Coincide on a Common Apex.
Two-Zone Contact of Roll End Insures Roll Alignment. (Patented Dec. 6, 1930, Patent No. 1784914.)
Ground Radius of Cone Flange Prevents Noise and Chipping.
Oil Groove Provides Positive Lubrication for Roll Heads.
Large Area of Flange Reduces Unit Pressure.
Multiple Perforated Retainer for Roll Spacing.
Case Hardened Alloy Steel Cup and Cone.
3
2
1

THIRTY-EIGHT years of Roller Bearing manufacture have proved that design is the most important element in a bearing.

Likewise, the use of many millions of Bower Roller Bearings as original equipment over a period of many years in America's leading large-production automobiles has proved the correctness of BOWER DESIGN.

Bearing users will appreciate that the exacting standards of the automotive industry and the severe usage of bearings in automobiles offer a challenge that no roller bearing can meet unless it possesses the highest degree of quality known to the bearing industry.

One of the secrets of Bower's leadership is the fact that its technical men have never waited upon the ingenuity of other men. Bower engineers push relentlessly ahead—far beyond the needs of the moment—to make new technical discoveries and to apply them always in ADVANCE.

This Tapered Roller Bearing is a leading example of Bower design. It embodies important advantages that no other bearing possesses—advantages that Bower engineers discovered and incorporated ahead of all others.

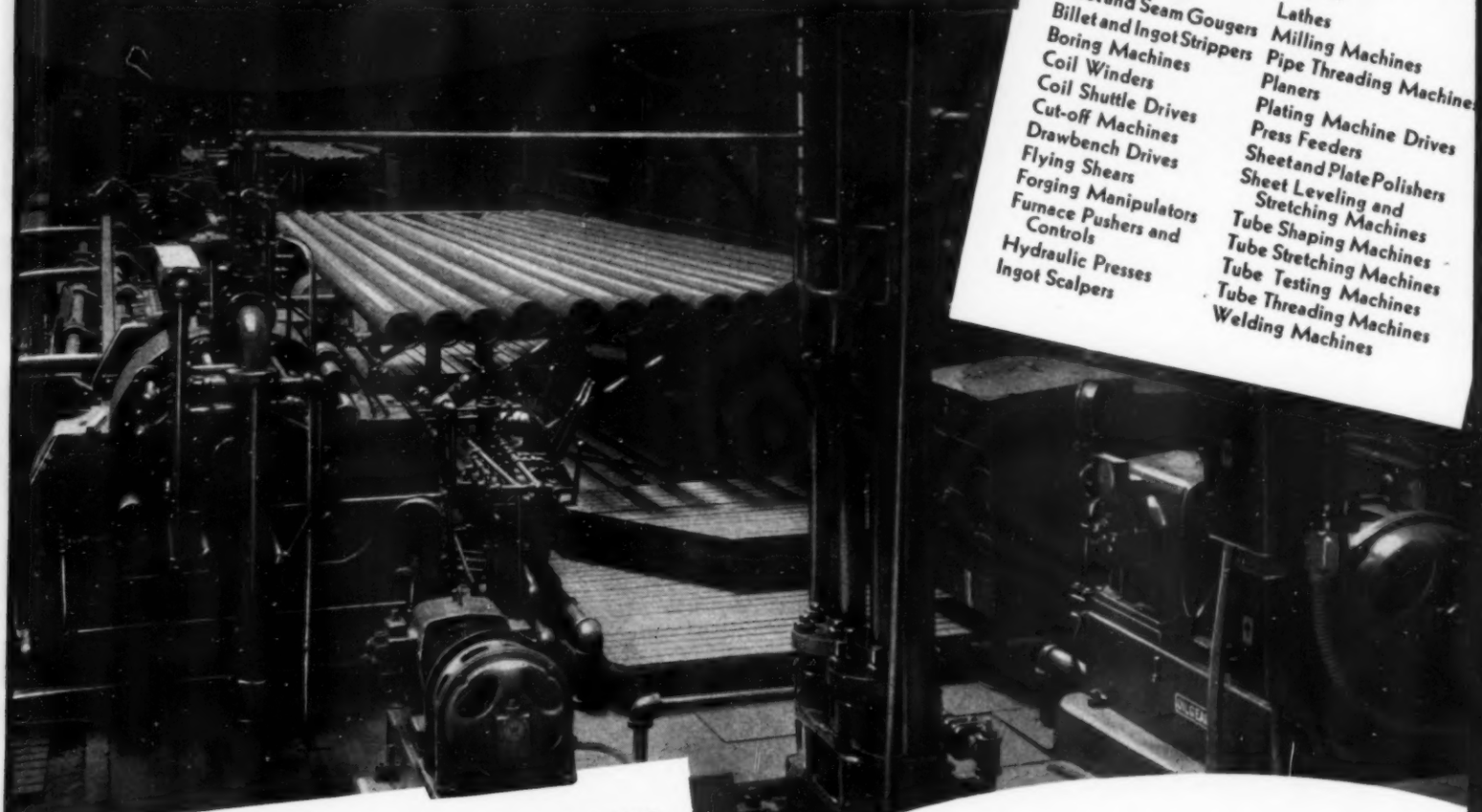
For more detailed information on Bower design, ask us for a copy of the folder, "Secrets of Bower Roller Bearing Design and Quality."

BOWER
ROLLER BEARING CO.
Detroit, Michigan

Bower Finish Like A "Face-Lifting" Operation

1. ROUGH GROUND—Photomicrograph—25 diameters—showing amorphous film with roughness of approximately 15 micro-inches (millionths of an inch). **2.** FINISH GROUND—More but finer scratches—surface finish of approximately 10 micro-inches composed of amorphous metal left by finish grinding—Photomicrograph of 25 diameters. **3.** FINAL FINISH—25-diameter photomicrograph showing amorphous metal and grinding marks removed, baring hard surface and smoothness of approximately 3 micro-inches—scratches below surface.

Flexible Power THAT ADDS SPEED, SAVINGS AND PRODUCTION TO ALMOST ANY TUBE OR STEEL MILL PROCESS



A FEW of the Steel and Tube Mill applications where Oilgear Fluid Power provides important advantages:

- Billet Pushers
- Billet and Seam Gougers
- Billet and Ingot Strippers
- Boring Machines
- Coil Winders
- Coil Shuttle Drives
- Cut-off Machines
- Drawbench Drives
- Flying Shears
- Forging Manipulators
- Furnace Pushers and Controls
- Hydraulic Presses
- Ingot Scalpers
- Lathes
- Milling Machines
- Pipe Threading Machines
- Planers
- Plating Machine Drives
- Press Feeders
- Sheet and Plate Polishers
- Sheet Leveling and Stretching Machines
- Tube Shaping Machines
- Tube Stretching Machines
- Tube Testing Machines
- Tube Threading Machines
- Welding Machines

OILGEAR SERVES THE HYDROSTATIC PIPE-TESTING MACHINERY IN 4 WAYS

Here Oilgear is used: (1) to clamp pipe to prevent buckling; (2) to close pipe heads; (3) to actuate intensifiers for increasing water at city pressure to 6000 psi; (4) to eject pipe after testing. Pipe is rolled into cradle of machine between testing head and tail carriage. Oil from a DP-811 Oilgear Pump closes ends of pipe and actuates clamping cylinders. Water is directed into pipe under city pressure. Then Oilgear DP-6025 Pump actuates two intensifiers to increase water pressure to best suit size and type of pipe tested (up to 6000 psi.) After inspection, pressure is released, testing head returned, and knockout cylinder ejects pipe onto rack.

IF YOU'VE never investigated Oilgear Fluid Power advantages, do so at once. They may solve your toughest power problems. Oilgear Fluid Power Systems are *flexible* in every sense of the word . . . shaped to fit your most exacting requirements . . . and give you better, faster, and more profitable production.

The Hydrostatic Pipe-Testing Machine illustrated on this page, for example, shows one Tube Mill application of Oilgear Fluid Power where the unique control advantages of Oilgear make operations simpler, safer, and more dependable. The chief engineer of its owner reports that he is highly satisfied with the results.

Oilgear Fluid Power Systems efficiently convert any constant speed rotary mechanical motion into a smooth, positive, constant or variable linear or rotary motion with exceptional accuracy. Large masses are moved, reciprocated or rotated under absolute control, reversals are quick and cushioned, power is easily and conveniently applied. Simplified manual, hydraulic and electric controls; great flexibility in location of units; adjustable working pressure; ability to maintain maximum pressure indefinitely without overheating or waste of power; automatic lubrication and overload protection . . . All these Oilgear features and many more promise outstanding improvements in Steel and Tube Mill processes and production methods.

Don't underestimate the importance to you of fluid power . . . especially Oilgear Fluid Power which is generally conceded to lead the field. Submit the specifications of your power problem or write for the 55-page booklet, Bulletin 47000. THE OILGEAR CO., 1302 W. Bruce St., Milwaukee, Wis.

Feeds • Pumps
Cylinders • Valves
Motors • Transmissions

Horizontal and Vertical Broaching Machines
Horizontal and Vertical Presses
Custom Built Machines

OILGEAR

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fluid power

THE OILGEAR COMPANY, 1302 W. Bruce Street, Milwaukee, W

Please send me a copy of Bulletin 47000 without obligation.

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One Ton
of KENNAMETAL TOOL TIPS In A Single Order

Proves the Acceptance of this Superior Steel-Cutting Carbide

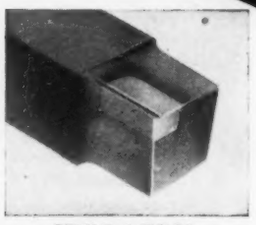
● Recently, McKenna Metals Company shipped a single order of over *one ton* net weight of KENNAMETAL grade KM tips. Since carbide tool tips are weighed in grams, this order contained thousands of tips later to be brazed on tools for machining steel. Such orders are the result of complete confidence in KENNAMETAL.

The wide acceptance of KENNAMETAL by industry both here and abroad is proof of its superiority and reliability. The basic ingredient (tungsten-titanium carbide) in KENNAMETAL tool tips is harder than any other carbide tool material; therefore permits greater production per tool grind. In addition, the superior strength and "crater resistance" of KENNAMETAL minimizes breakage and guarantees dependable performance over a long period of tool life.

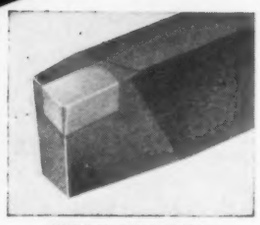
Prompt Shipments on Standard Tools

Standard and Modified Standard KENNAMETAL tools are shipped within 10 days of receipt of order; Standard tool blanks within 3 to 4 days.

WRITE FOR THE KENNAMETAL CATALOG NO. 42



STYLE 6 TOOL

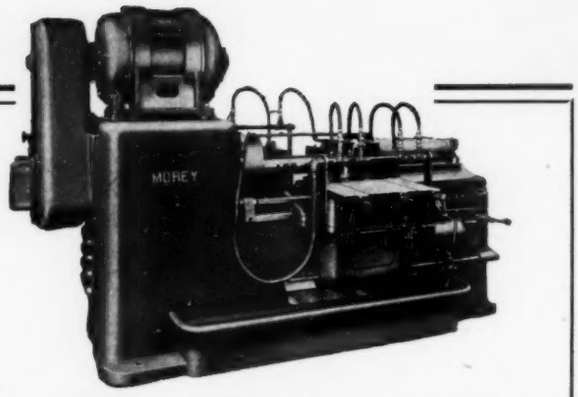


STYLE 19 TOOL

STYLE 12 TOOL

STYLE 11 TOOL

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PENNA.
FOREIGN REPRESENTATIVES: U.S. STEEL EXPORT CO.
Exclusive of Canada, Great Britain and Possessions



The "27" MOREY Semi-Automatic HEAVY DUTY LATHE

TIMKEN TAPERED ROLLER BEARINGS FOR THE MAIN SPINDLE—ALL OTHERS ANTI-FRICTION

Just the machine for Shell Work!

Suitable for rough or finish turning shells at maximum feed.

Put your shell operations on this fast, powerful lathe and turn out your work at top speed up to the limit of tool capacity.

Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.

Full use of carbide tools can be taken by this heavy duty lathe.

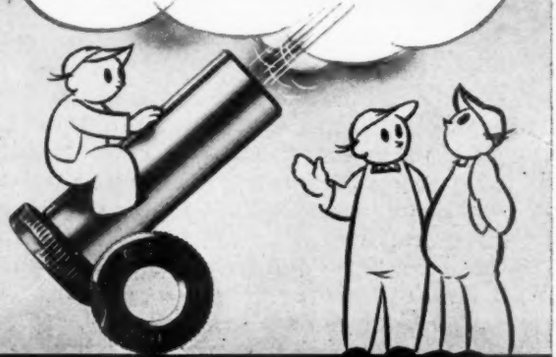
Ask for Circular No. 715

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

Universal
DRILL BUSHINGS ARE SPEEDING UP DEFENSE PRODUCTION

In scores of defense and manufacturing plants Universal drill bushings are doing an outstanding job.

Because of their super-finished bore straight and round within .0001 Universals assure accuracy and unexcelled wearing qualities. All standard sizes available. Write for facts and prices.

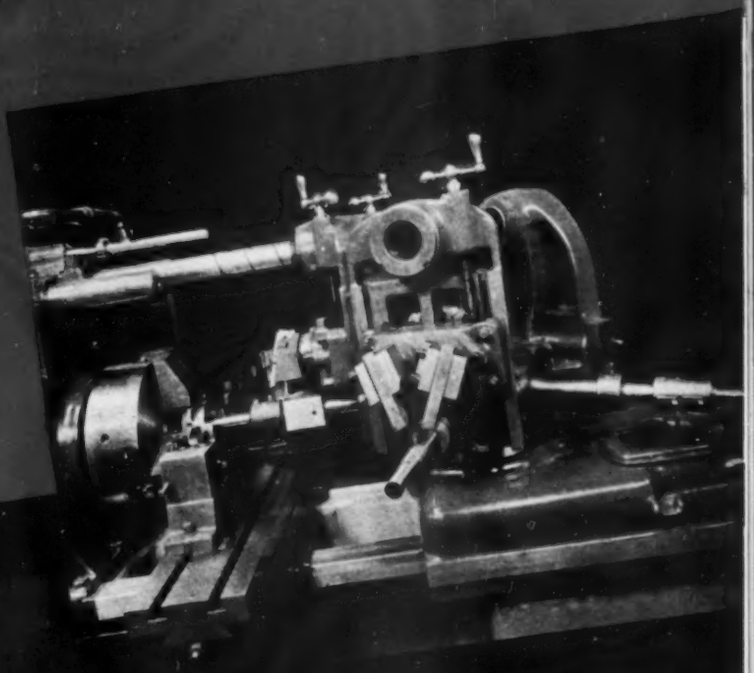


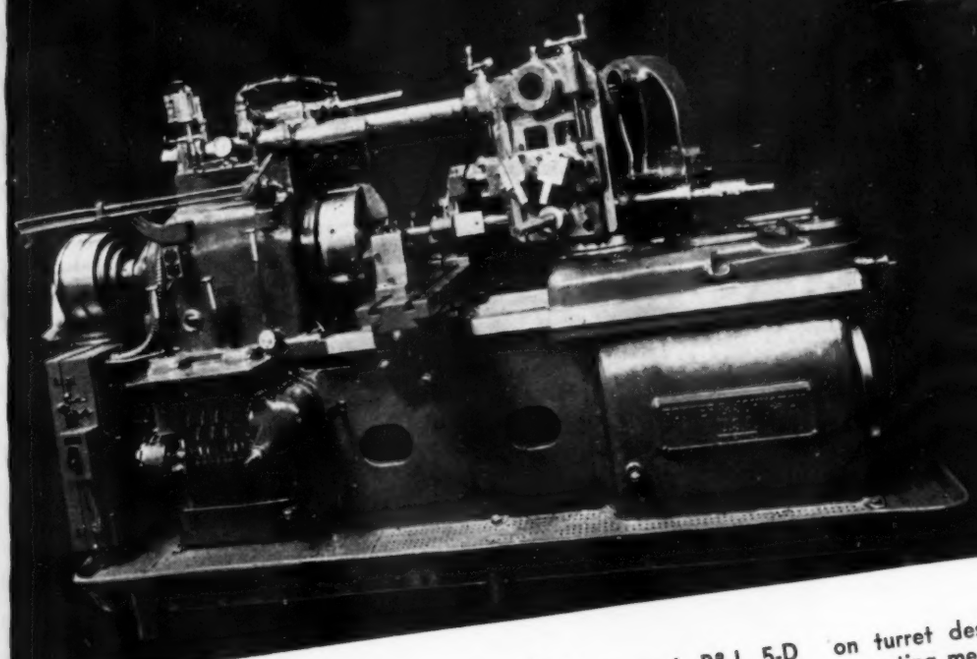
UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

18 BEARING CAGES IN 51 MINUTES
QUICKLY ADJUSTABLE TOOLING ENABLES

P&J 5-D POWERFLEX

to handle work in a wide size range . . . .





PRODUCTION DATA

Part: Bearing Cage
Material: Malleable Iron
Machine: 5D Single Spindle Powerflex
Operations:
1st T.F.: Rough bore hole; rough face flange; rough turn and face 4.871" dia.
2nd T.F.: Finish above cuts; chamfer where necessary
3rd T.F.: Ream hole 4.332" dia.
4th T.F.: Size turn 4.871" dia.
Machining Time: One operation only — 2.54 min.
Floor to Floor Time: 2.84 min.
Production: 18 pieces per 51 min. hour
One operator can easily handle four machines on this class of work.

A recent order was placed for several P&J 5-D POWERFLEX Automatic Chucking Machines for handling a considerable range of larger sizes of bearing cages. Each lot to be produced involved cages of different dimensions—a requirement which called for quickly adjustable type of tooling.

How this requirement was met is shown clearly in the accompanying photographs.

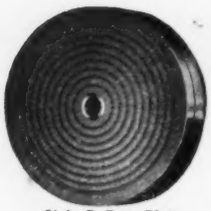
A cross slide is provided which operates simultaneously with the action of the turret tools and makes provision for mounting of rough and finish facing tools to the front and rear of the part. Whenever tooling requirements make operation of an auxiliary slide tool mounted on turret desirable, the cross slide acts also as an operating mechanism. Three automatic changes of feed are provided and available for action of the cross slide and turret slide. Power operation of speed and feed clutches make it practical to shift under load.

The 5-D POWERFLEX—one of the latest models in the P&J complete line of automatic chucking machines—is equipped with Timken bearings on spindle and headstock shafts. Headstock providing four automatic changes of speed is a self-operating unit. Turret slide and machine bed are equipped with hardened and ground steel ways. Turret is indexed by Geneva movement and automatically clamped after indexing.

POTTER & JOHNSTON MACHINE CO.

PAWTUCKET, RHODE ISLAND

WALKER *MAGNETIC* CHUCKS



Style D Face Plate
"Concentric Gap" type

Where there's a chucking job to be done . . . there's a "WALKER" to do it . . . economically . . . efficiently . . . . . .

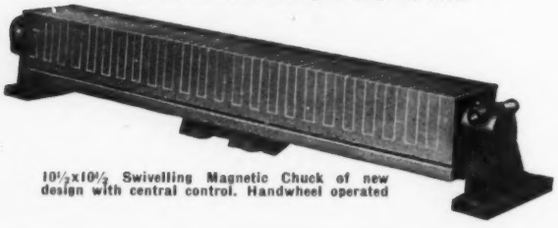
Walker Magnetic Chucks—in a complete standard range of types and sizes—are available to cut costs and increase profits on grinding, milling, planing and turning operations. These units are recognized as the "best way to hold most work and the only way to hold some of it."

The standard line of Walker Magnetic Chucks includes Rectangular, Swivelling, Vertical Face and Rotary type units, and are products of more than thirty-five years specialized experience.

Because of the completeness and diversity of the line, it is possible to select standard units for practically every service requirement, an advantage which means savings in both time and money and assures your being able to obtain designs that are of proved construction and performance.

Universal Swivelling Magnetic Chuck

No. 617 Bar Pole Face Rectangular Magnetic Chuck



10½x10½ Swivelling Magnetic Chuck of new design with central control. Handwheel operated

Special Chucks for special needs

To take care of special requirements, Walker is equipped to render prompt service in furnishing Magnetic Chucks of special design.

Use our engineering service

The Walker engineering department is at your service to help you select the magnetic chuck best adapted to your requirements. Ask us to study your problems. Send for illustrated bulletins giving detailed information on the Walker line.

O. S. WALKER CO., INC.
WORCESTER, MASS.

SELECTOR DIAL CONTROL TURRET NO. 2 LATHE

SIMPLE TO OPERATE
EFFICIENT . . . ECONOMICAL

FEATURING
MICRO-SPEED DRIVE
and SPINDLE BRAKE

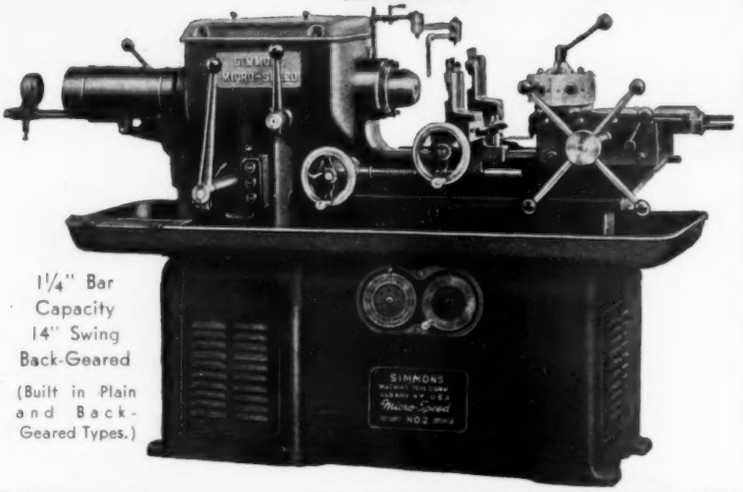
This No. 2 turret lathe, designed to give you higher precision, is equipped with two features that make it a really outstanding performer.*

MICRO-SPEED DRIVE—
for any of 1000 different spindle speeds.
SPINDLE BRAKE AND CLUTCH—
for instant stopping and starting.

The result? The Right Speed for The Job! And that means closer tolerance and faster production.

** Letters from users of Simmons Turret lathes testifying to their superiority will be furnished upon request.*

Write TODAY for illustrated brochure.



1¼" Bar Capacity
14" Swing
Back-Geared

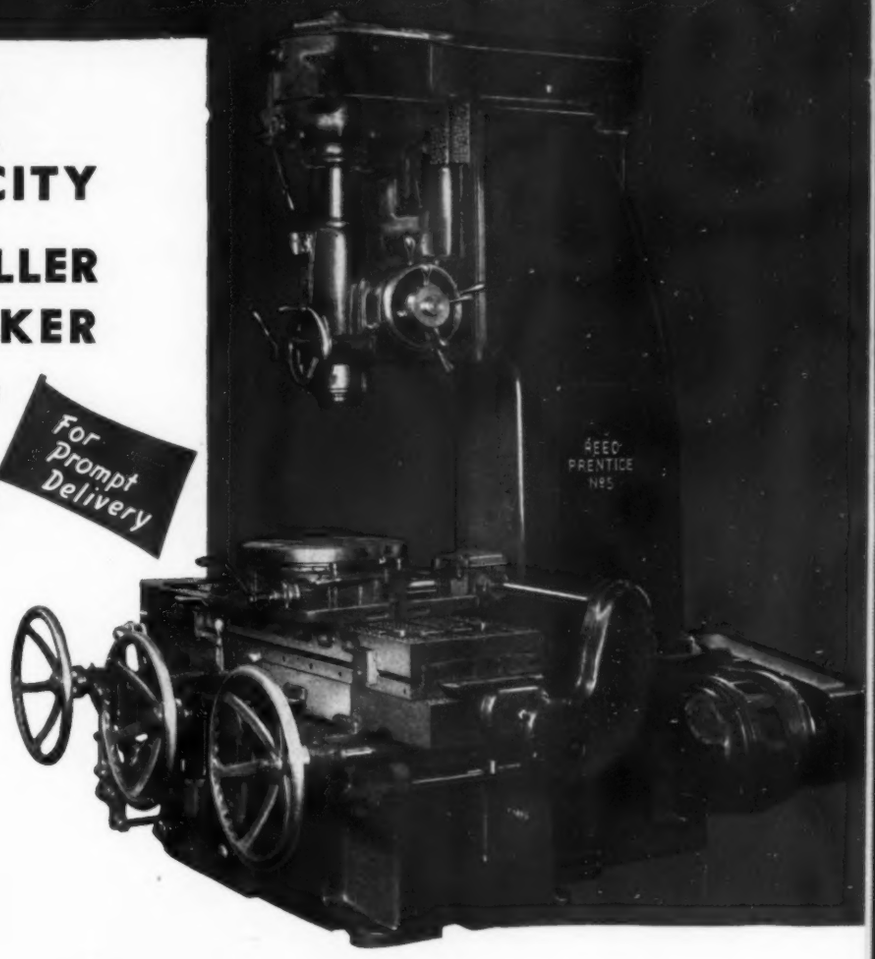
(Built in Plain and Back-Geared Types.)

SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY, ALBANY, N. Y.
NEW YORK OFFICE: 149 BROADWAY

To Speed Deliveries.

REED-PRENTICE
HAS DOUBLED CAPACITY

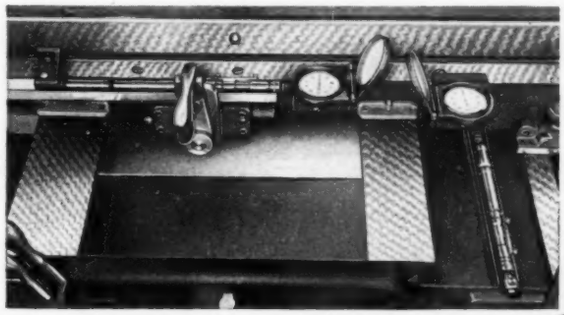
No. 5 VERTICAL MILLER AND DIE SINKER
with Helical Gear Spindle Drive



For Prompt Delivery

Modern engineering design, the best materials for the duty involved, and skilled workmanship are combined in the No. 5 Vertical Miller to give users fast, accurate, low-cost performance on milling and die sinking operations. Applications on which this machine is successfully used include: rubber and plastic molds; dies for die casting and drop forging; and general milling operations. Very favorable delivery can be made.

No. 5 JIG BORER AND VERTICAL MILLER

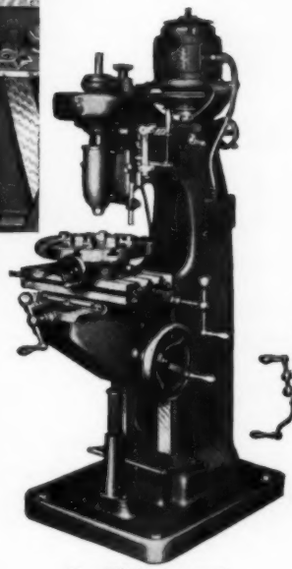


In addition to handling any of the applications mentioned above, the No. 5 Jig Borer is equipped with precision measuring devices (as in close-up view) for extremely accurate operations on jigs and fixtures. Greatest productive returns are thus received, with low investment in equipment.

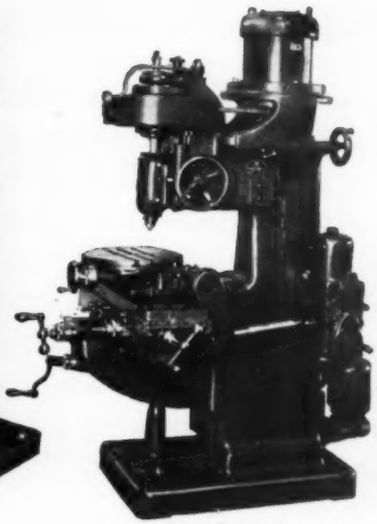
SPECIFICATIONS

	No. 2V	No. 3VG	No. 3VGS	No. 5
Longitudinal feed	16"	24"	27"	*48"*
Cross feed	11"	12"	20"	*16"*
Table length	20¼"	44"	32"	60"
Table width	8⅞"	10¼"	22"	16"
Head travel	.....	5"	5"	15"
Vert. feed of knee	15"	18"	16"	.....
Net weight (lbs.)	1650	2850	4795	11,500

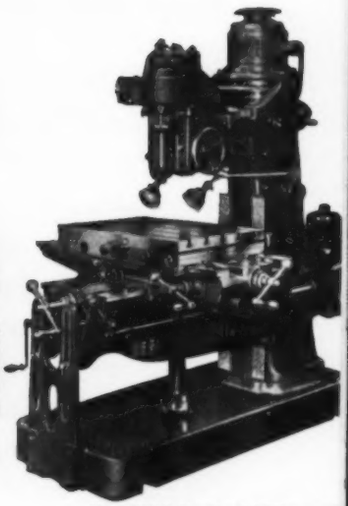
Power feeds are shown in italics.



No. 2V Router and Vertical Miller



No. 3VG Vertical Miller and Die Sinker



No. 3VGS Vertical Miller and Die Sinker

The accuracy, ruggedness and ease of operation of these three machines, make them well adapted for the fast production of many vital parts used on guns for aircraft, tanks and infantry. They also find wide application in the manufacture of rubber, glass or plastic molds, as well as dies for drop forging and die casting. One of these machines may solve your production difficulties. Detailed proposals gladly submitted—without obligation, of course.

MAIN OFFICE:
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WORCESTER MASS., U. S. A.

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Counts Double Today

WIZARD Quick-Change Chuck Outfits can save time for you by turning drill press jobs of two or twenty operations into a continuous performance. They enable the operator to change tools without stopping the spindle. WIZARD Collets hold tools rigid and centered, an exclusive McCrosky Feature. WIZARD Friction-Drive Tapping Collets permit tapping at drilling speed with safety . . . Ask for McCrosky WIZARD Bulletin 15-D.

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MEADVILLE — PENNSYLVANIA
COST CUTTING TOOLS

SUPER ADJUSTABLE REAMERS — ADJUSTABLE BLOCK BORING BARS
JACK-LOCK MILLING CUTTERS — SPECIAL PURPOSE TOOLS
WIZARD QUICK-CHANGE CHUCKS — McCROSKY TURRET TOOL POSTS

TUNGSTEN CARBIDE TIPPED TOOLS
Price $1.00 Each In Any Size

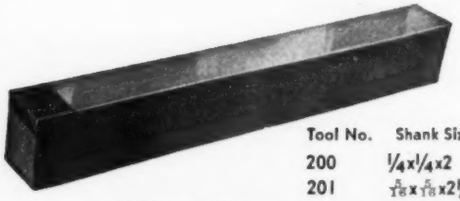
New Low Prices — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

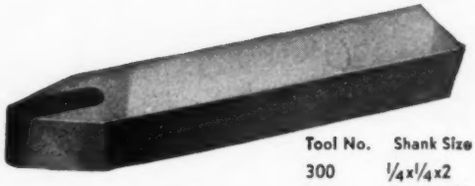
SERIES 100

Tool No. RH	Tool No. LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

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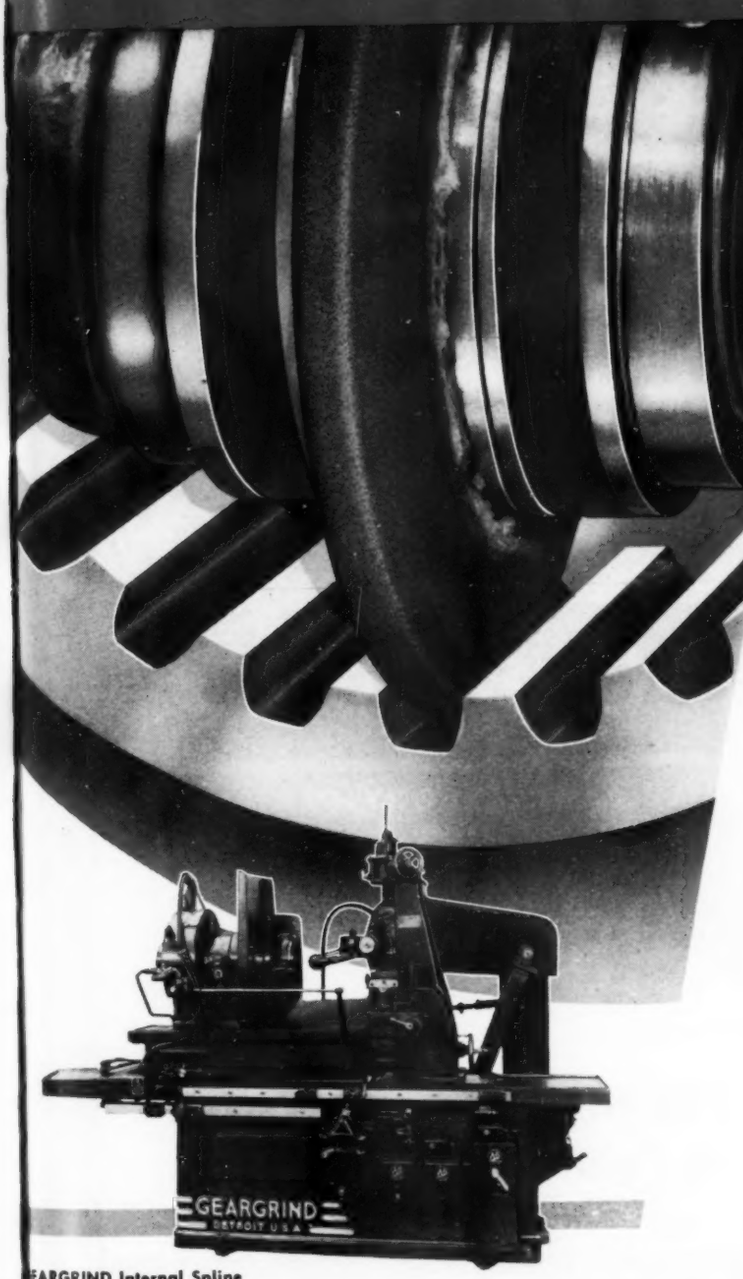
VICTOR MACHINERY EXCHANGE, Inc.
251 CENTER STREET — NEW YORK, N. Y.

FORMED WHEEL

Internal Spline Grinding



GEARGRIND Internal Spline Grinder, Type GG-31

GEARGRIND Internal Spline Grinding Machines are manufactured in standard and special types. They are setting new standards of performance in producing internal splines with involute keys.

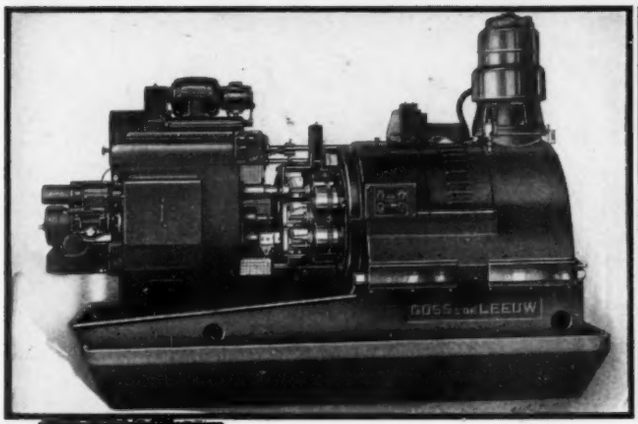
The type illustrated grinds splines, or gears, with internal diameters of from 3½" to 16" and up to 120 teeth. It maintains the following tolerances: Key or tooth thickness, within .0002; key or tooth spacing error, within .0004, maximum; root diameter, within .0002.

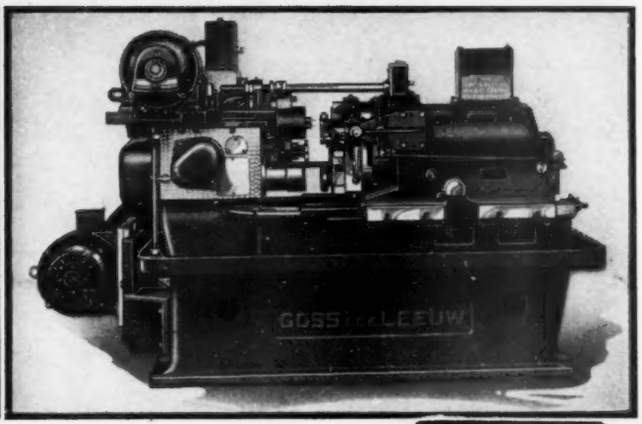
GEARGRIND Machines are available for all types of formed wheel grinding—internal and external gears, internal and external straight and involute splines, and racks. Our standard machines cover a wide range, but special machines to meet your individual requirements can be produced. Your letter will receive prompt attention.

The GEAR GRINDING MACHINE COMPANY

DETROIT, MICH. U.S.A.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Pre-loaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

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WILLARD SPRING TOOL HOLDERS

FOR AIRCRAFT—AUTOMOBILE & ACCESSORY PLANTS

THREADING & FORMING

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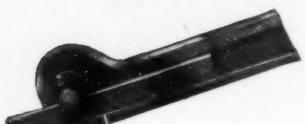

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The Highest Development in Tool Holder Efficiency

Information on Request

NO CHATTER

No Breaking of Cutter

No Damaged Work

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Manufacturers of THOMPSON SUBMACHINE GUN
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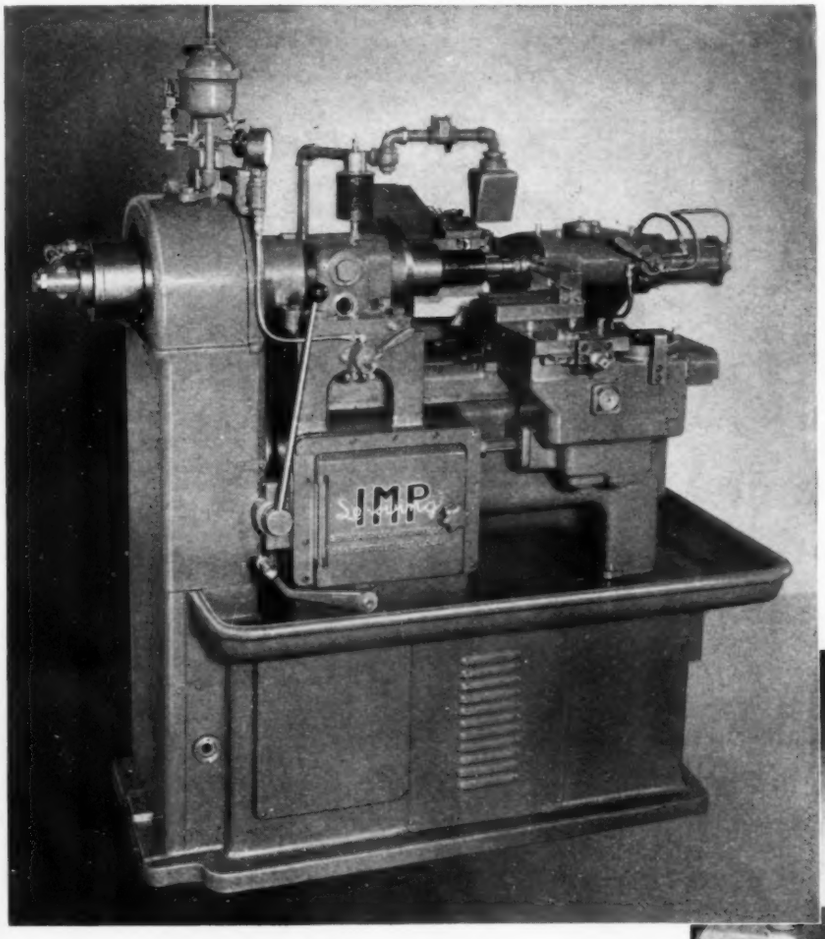
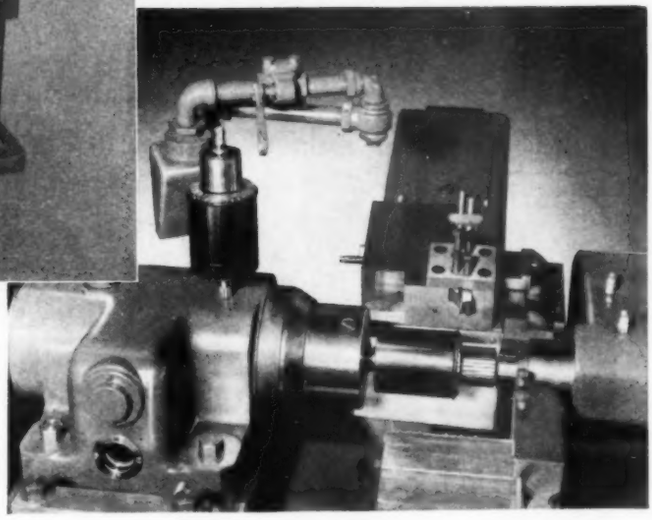
TRADE-MARK Thompson REG. U.S. PAT. OFF.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP LATHE AUTOMATICALLY TURNS AND FACES COMMUTATORS TO HIGH ACCURACY AND FINISH REQUIREMENTS





Close-up showing detail of template-controlled facing tool on Back Attachment.

PROBLEM: To automatically turn and face electric starter commutators; to provide a fine finish and maintain extremely close tolerances.

SOLUTION: The Lo-swing IMP Lathe with special equipment was selected for this job primarily because of inherent design features. Its spindle bearings are designed to permit the very high spindle speeds necessary for turning copper alloy, and the method of fitting the carriage to the bed, with flat and "V" ways, assures unusual turning accuracy.

The work is held and driven from one of the ball bearing seats of the shaft with an air-operated collet chuck. The tailstock end is supported on the other bearing seat by a collet chuck mounted in a revolving spindle which is operated through the air-controlled tailstock spindle quill. This method of holding and driving the rotor from the ball bearing seats assures the close concentricity which is required between the bearing seats and the O. D. of the commutator. The operation consists of turning the O. D. of the commutator, the facing of the angular shoulder (which is part of the commutator) and the chamfering of the shoulder. It should be noted that the 6° angle is faced with a template-operated tool block in order to obtain a very smooth finish, free from all chatter marks.

FOR SUPPLIES OR FOR SERVICE

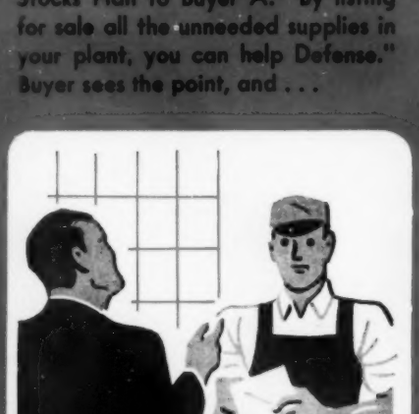
Consult Your Local Industrial Distributor

HERE IS A TYPICAL EXAMPLE OF THE SERVICE HE IS RENDERING NOW

Distributor salesman explains Surplus Stocks Plan to Buyer A: "By listing for sale all the unneeded supplies in your plant, you can help Defense." Buyer sees the point, and . . .

. . . during inventory time at Plant A many usable supplies, bought long ago, are brought to light. The list goes to distributor, or to local distributors' association, where . . .

. . . Surplus Stocks listings are being collected. A Master List is compiled and sent to all local industrial plants, offering to sell them any of the excess materials.



Later, at Plant B, the purchasing agent gets a request for same scarce items. "Deliveries are terribly slow," he warns, "but wait, maybe I can find these items in Surplus Stocks . . ."

. . . He does, and telephones his distributor. "They're still available, you say? Standard products? Never been used? Fine . . . fine, please send them right over . . ."

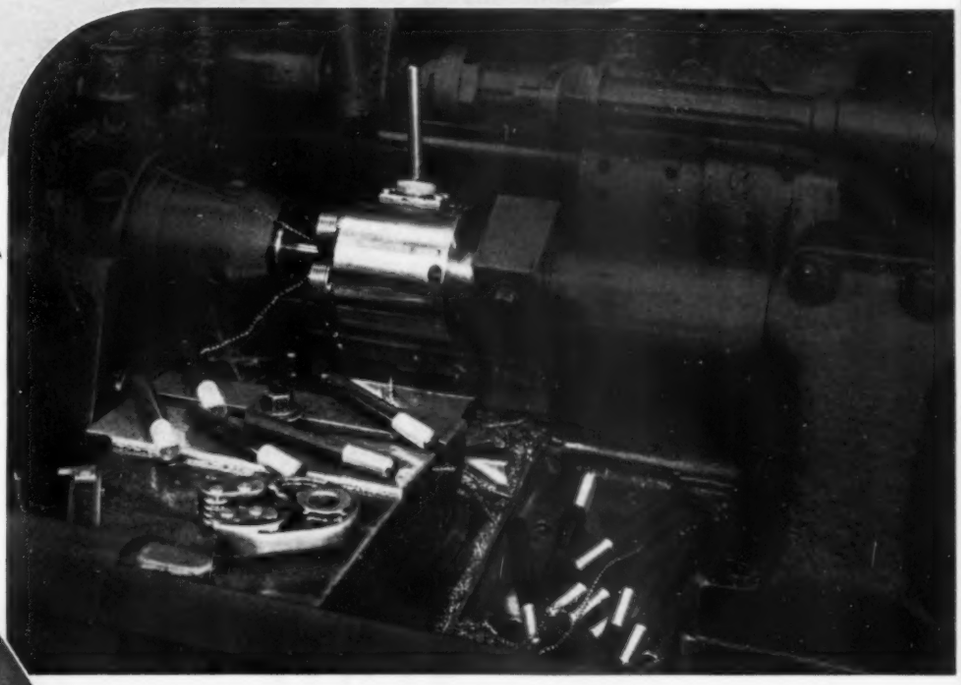
. . . Distributor picks up items from Plant A and delivers them to Plant B, thus serving both plants and making a valuable contribution to the cause of Defense.

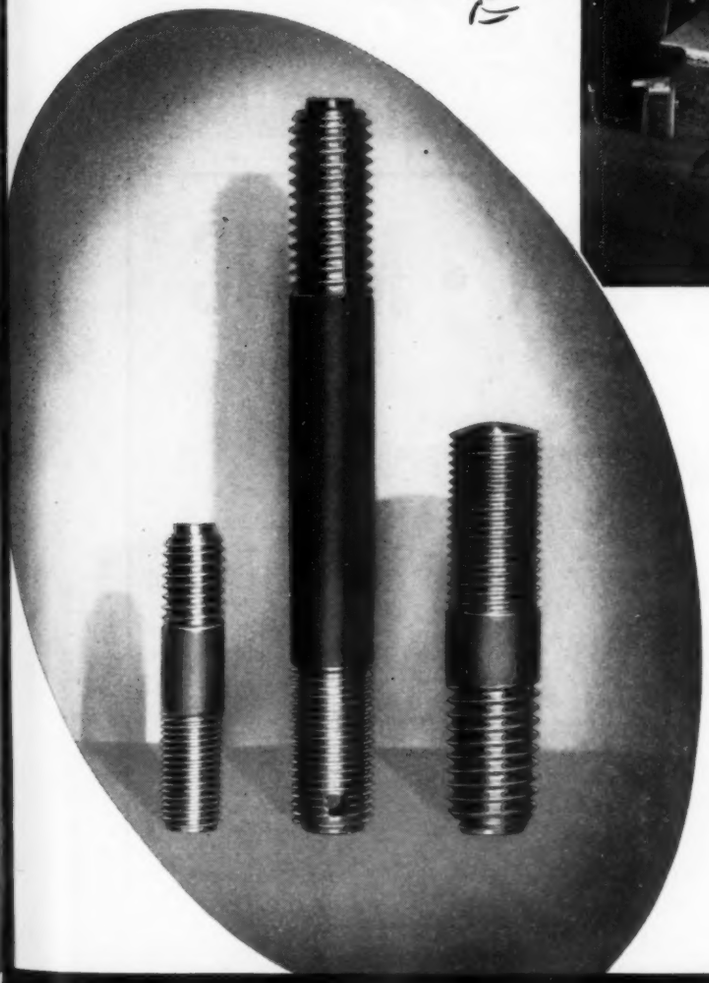
Published in the interest of industrial distributors by

MILL SUPPLIES 330 West 42nd Street, New York, N. Y.

Since 1911, the ONLY Magazine serving industrial distributors and their salesmen exclusively.

AT *White* MOTOR CO.—NAMCO DIES WITH GROUND THREAD CIRCULAR CHASERS CUT MILLIONS OF *CLASS 5 WRENCH FIT STUDS





If you've had much to do with Class 5 Wrench Fit Threads you know that those cut on heat treated alloy steel motor studs are a tough job, yet must be EXACTLY right ALL the time:—to help insure motor stability at high performance,—to avoid time loss on the shop assembly lines.

"White" trucks, both ordnance and commercial, speak for themselves. For over 10 years ever increasing numbers of Namco Circular Chaser Dies have met the high threading standards of the White plant for enormous quantities of threads of all kinds, and with never a failure. They too speak for precision and endurance. What about *your* threading?

*See U. S. Dept. of Com.—Nat'l Screw Thread Comm., Bul. 141

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MOREY NO. 2G & NO. 3 TURRET LATHES

Motor Drive
Infinite Spindle Speeds

Any spindle speed you want—a direct reading dial shows when you've got it.
Permits the use of carbide tools for fast cutting.
Turret clamps and unclamps automatically.
Equally effective on second operation and chucking work.

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SPEEDS from 90 to 180 R.P.M. or 180 to 3600 R.P.M.
CAPACITY 1" x 6½" turning length.
Ask for Bulletin #629

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SPEEDS from 60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY 1½" x 9" turning length.
Made in Plain and Universal Types
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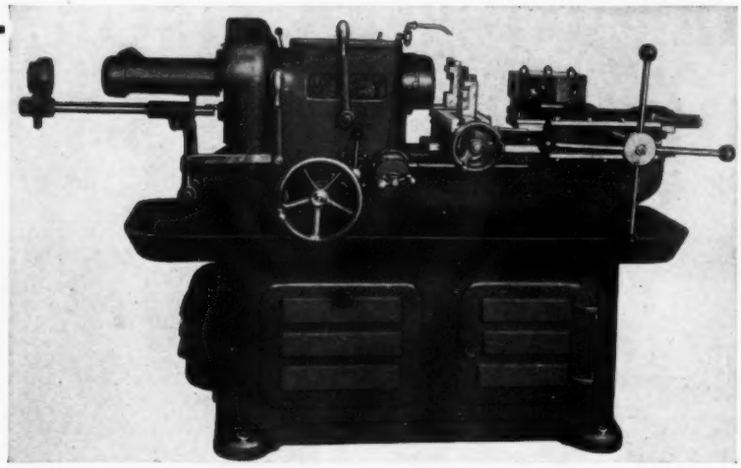

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ALL OTHERS ANTI-FRICTION

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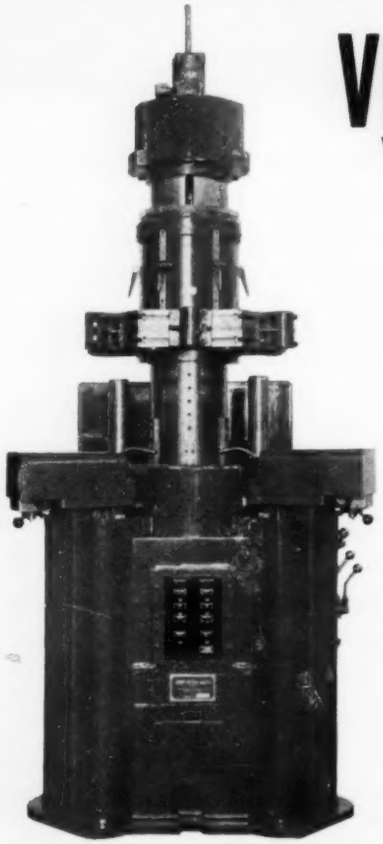

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VERTICAL CHUCK **HYDRAULICALLY OPERATED** **FULLY AUTOMATIC**

. . . Chucking Machine

SPECIFICATIONS

SPINDLE: Nose 6" diameter, type A.
BEARINGS: Precision taper roller type.
SPEEDS: 18 spindle speeds; 15 to 1000 R.P.M.
CAPACITY: 16" maximum diameter. 9" full boring bar depth of turret.
SIDE HEADS: 12" vertical movement. 3½" horizontal movement.
FEEDS: All hydraulic.
TURRET: 6 faces 15"x5¼" wide, fitted with 2 T slots.
HEIGHT OF SPINDLE NOSE: Working height, 42".
MOTOR: 7½ H.P.B.B. 1150 R.P.M. 3-60-220/440 V. or to suit.

REASONABLE DELIVERY

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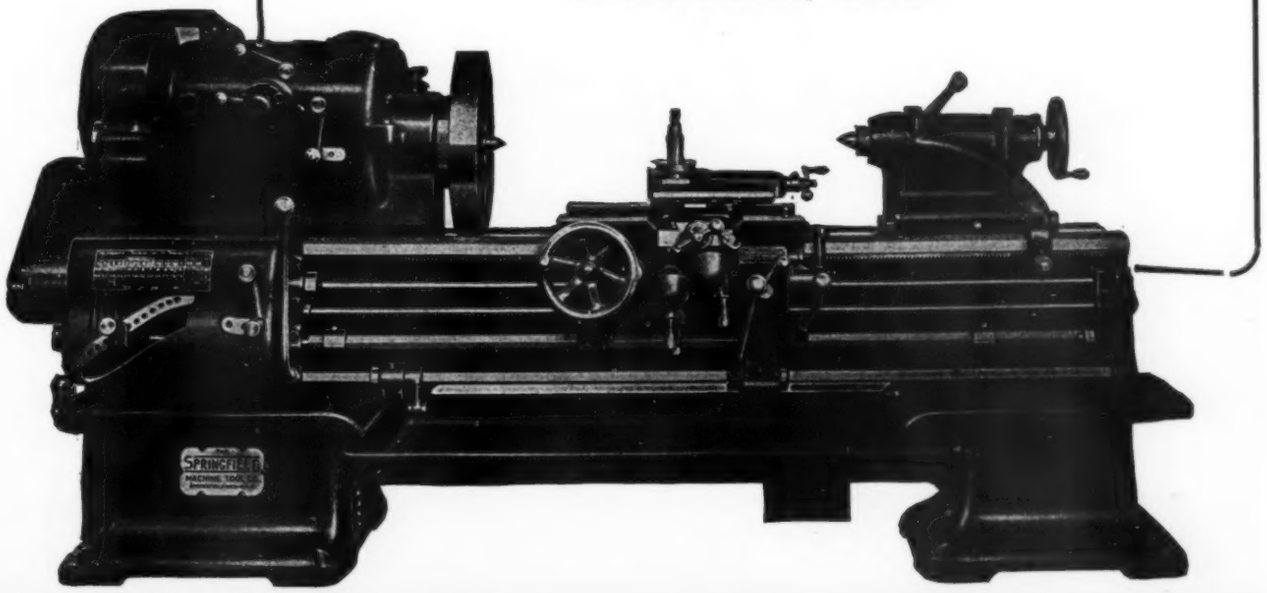
...LOOK TO SPRINGFIELD PRECISION LATHES!

. . . here is a lathe which is truly modern from headstock to tailstock. Features which are especially timely mark it as an outstanding value for both tool room and quantity production use. Primary among these features—one that assures accuracy, and therefore is of great importance to munitions manufacturers—is MATERIALS.

Springfield Lathe beds are made in our own foundry—of highest nickel-chrome gray iron—an operation that enables us to *guarantee* strength and wear-resisting qualities . . . allows us to follow through on each casting operation . . . makes *certain* every rigid standard we specify. Springfield iron itself, too, is especially resistant to warping and marring, even under severest service. Here, then, are factors that account for the sustaining, over long periods of use, of the original accuracies built into every Springfield Lathe.

The **SPRINGFIELD MACHINE TOOL** *Co.*

SPRINGFIELD, OHIO



Retooling, especially for munitions manufacturers, should take into consideration (1) extreme ACCURACY and (2) maintenance of such accuracy. In other words, LONG LIFE. And the Springfield Lathe delivers both!

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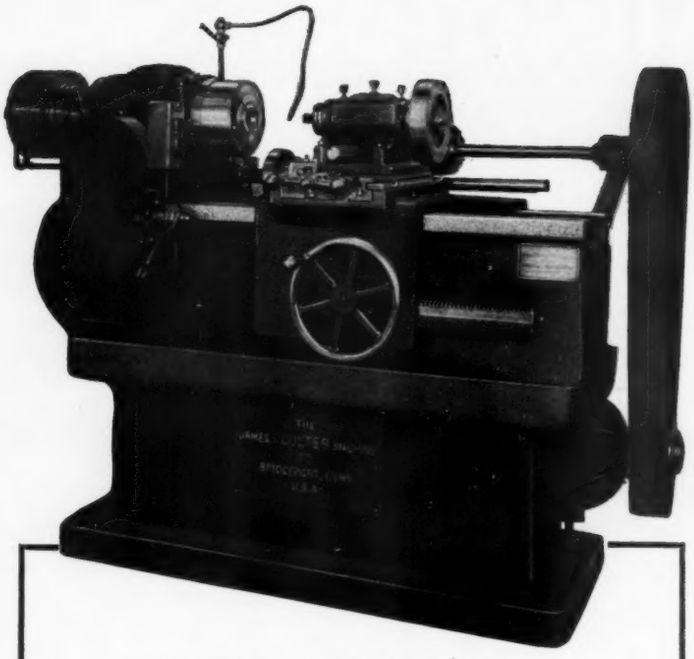
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

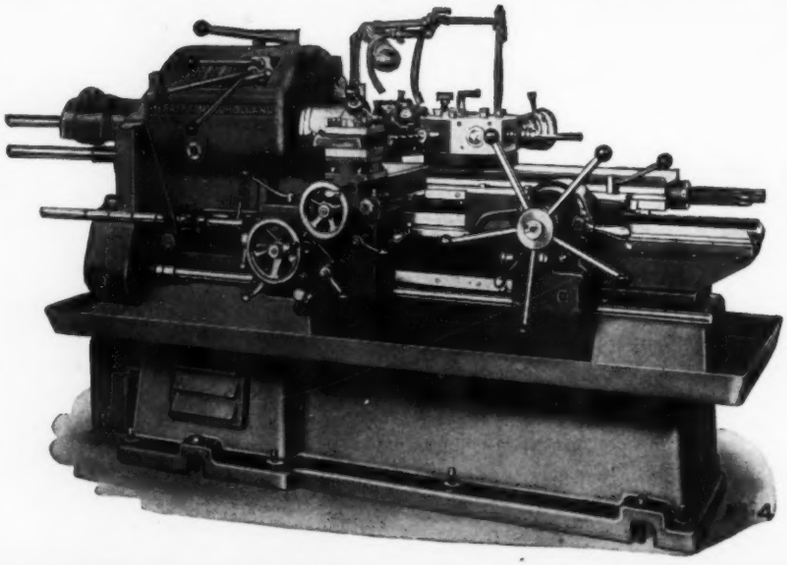
Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

MODEL 4 2" BAR CAPACITY MERRITT-MILLHOLLAND TURRET LATHE



★

A Modern Machine Tool Designed for Low Cost Production

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Favorable Deliveries

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Also 2½" Bar Capacity Available

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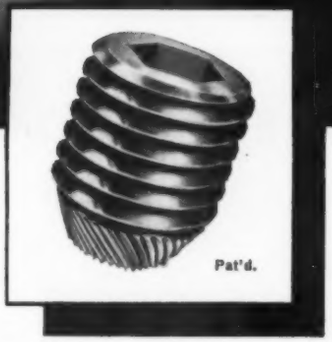
THE HEAD has it!



"UNBRAKO"

Knurled Socket Head Cap Screws

Yes . . . the head has it, and it's KNURLING—famous "Unbrako" feature for years and at no extra cost!

Today the speed-up advantages of KNURLING are being realized more than ever before. Dry or greasy fingers gear right to dry or greasy knurls and prevent annoying time-wasting slip—be it a job of assembling or adjustment. And the KNURLING also permits quick, easy locking of the screw after countersinking.

"UNBRAKO" Knurled Self-Locking Hollow Set Screws

No less famous is the self-locking feature of "Unbrako" Hollow Set Screws . . . and once again it's KNURLING that does the trick by locking the screw firmly in place after having been pulled up with no more than average pressure. No matter how severe the vibration, you can count on the "Unbrako" Self-Locker to *stay set!* Yet it's easily applied or removed and can be used repeatedly.

Be sure to make your next order "UNBRAKO". You'll find it pays in many ways.

The KNURLING of Socket Screws originated with "UNBRAKO" years ago.

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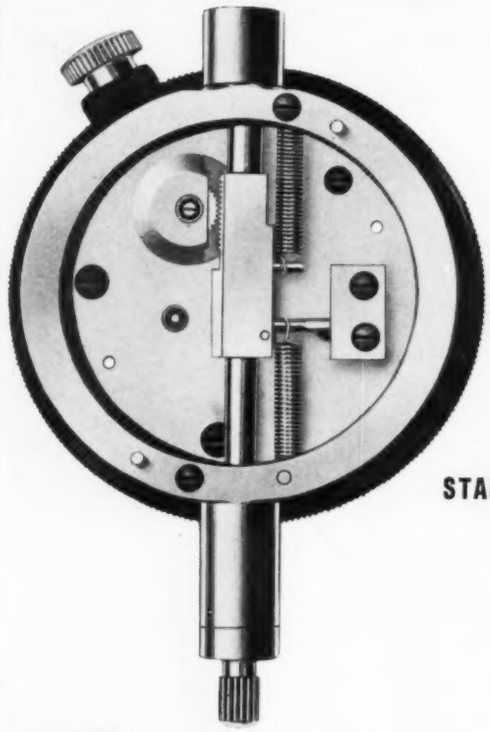
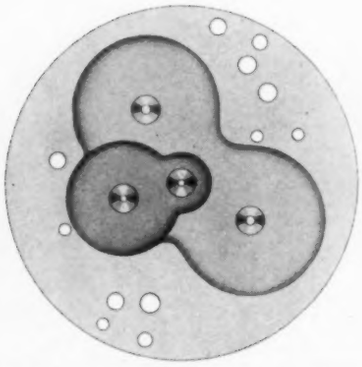
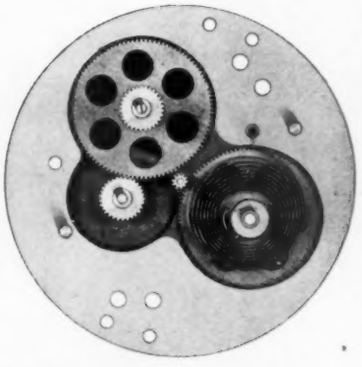
UNBRAKO *Screw Products*







STANDARD DIAL INDICATORS WITH "MILLIOTURN" BEARINGS

"Millioturn" bearings so called because test runs of over 22 Million continuous operations have proved their almost friction-free support of spindle and gears.

"Millioturn" bearings combined with our *Shockproof Design* make Standard Dial Indicators:

the most reliable
the most durable
the most economic.

"You can't wear them out."

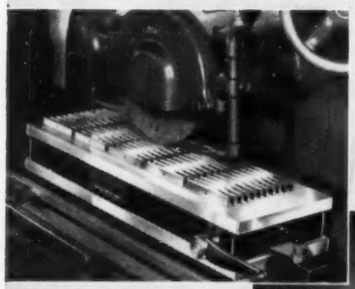
STANDARD *Dial Indicators*

STANDARD GAGE CO., INC.
72 PARKER AVENUE **POUGHKEEPSIE, N. Y.**

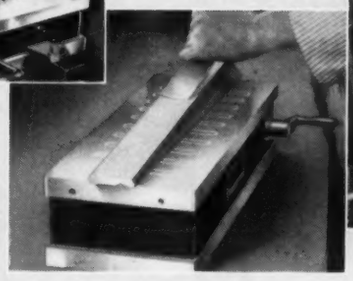
WIDER USES OF BROWN & SHARPE MAGNETIC CHUCKS

Permanent Magnet Type

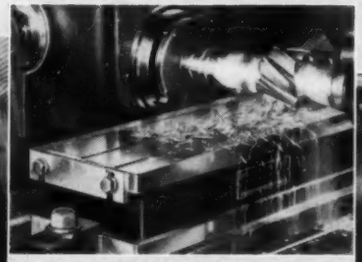
- - where You can utilize their productive features



Above — Uniform magnetic force adapts chucks for holding groups of parts for grinding.

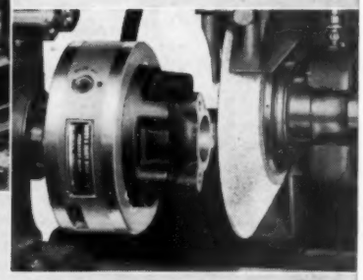


At Right — Holding gib for scraping. Portability adapts chucks for many similar jobs.



Above — Holding thin steel slab for climb milling. Also extensively used on shapers.

Below — Cylindrical and face or disk grinding is done easily and quickly with Rotary Model Chuck.



No Wires — No Heating — No Operating Costs

For sale only in the U. S. A. and its Territories

B·S

Write for circular describing Rectangular and Rotary Models

BROWN & SHARPE MFG. CO., PROVIDENCE, R. I., U. S. A.

BROWN & SHARPE

When High Speed Tools Are Hard to Get You Need These

OLIVER TOOL-SAVERS

Scarcities of high speed tools are making Oliver Tool Conditioners "life savers" of production. In many a plant they are more than paying their way by keeping every drill, tap and cutting tool performing with "new tool" efficiency and accuracy, giving extra hours of tool service that are so valuable today.

The Oliver Tool Conditioners illustrated are easy to set up, fast and accurate in operation. With them you can reproduce, automatically and with mathematical accuracy, the cutting edges and contours of all types of tools.

And, in addition to longer tool life, Oliver-conditioned tools will give you consistently accurate results, reduced power consumption, fewer rejects and less wasted time—all important factors in speeding up defense production.

OLIVER No. 2 ARC FACE MILL GRINDER

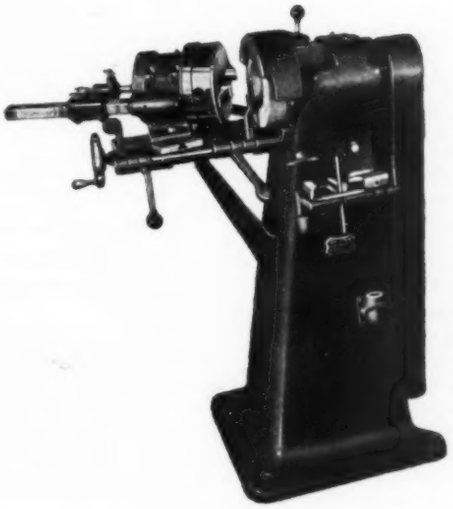
For all face mills from 6 to 26 inches in diameter. Eliminates sharp corners, producing edges perfectly ground to any radius. Oliver - conditioned Face Mills gives smoother operation and cut longer between grinds. Used by leading manufacturers in automotive and other high-production industries.

OLIVER UNIVERSAL TOOL AND CUTTER GRINDER

With a few simple fixtures, grinds face mills, slitting saws, end mills, angular cutters, slab mills, spot facers, formed cutters, gear cutters, reamers, etc. Produces accurate clearances by direct reading—uniform teeth, correct angles and accurate cutting edges that give longer tool service. Work is held stationary and grinding wheel traverses tooth, adding to ease and accuracy of operation.

OLIVER INSTRUMENT CO.
1410 E. MAUMEE STREET
ADRIAN, MICHIGAN

Don't Neglect Your Toolroom It's the Backbone of Production!



OLIVER No. 510 DRILLPOINTER

For all drills from 1/4 to 3 inches in diameter—all angles from 82 to 160 degrees. Automatically produces the ideal hollow-ground point with variable clearance that means free cutting in any metal or plastic. Reduces drill cost by getting a greater number of accurate holes from every drill. Reduces production costs by making possible increased feeds and speeds.

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS, DIEMAKING MACHINES

How STERLING GRIND Help Wartime

THERE'S A TYPE, SIZE, and SHAPE FOR SPEEDING UP YOUR GRINDING OPERATIONS

THERE'S A CORRECT STERLING ABRASIVE. It is one of two kinds, Sterlith and Sterbon—(aluminum oxide and carbide of silicon). Both are very hard and fracture irregularly, making them very sharp. The Sterling Sterlith abrasives have a certain toughness that makes them ideally suited for grinding materials of high tensile strength. Sterling Sterbon abrasives are best for grinding low tensile strength materials. Their application to your problem can be quickly determined.

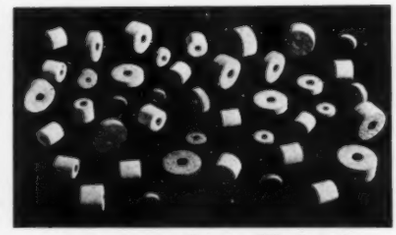
THERE'S A CORRECT STERLING GRAIN SIZE. Sterling makes available many sizes of abrasive grains for use in these popular "wheels of industry". The texture and amount of metal to be removed determine, to a great extent, the size of the grains out of which the wheel will be made. Wheel structure—that is, wheel density or porosity—determines the correct positioning of these abrasive grains for best grinding results. Determining what wheel porosity, and grain or combination of grains is proper for your job, is a problem we will gladly solve for you.

THERE'S A CORRECT STERLING BOND. The materials that bind the abrasive grains together in the form of a wheel are important since it is upon their holding power that the successful grinding operation depends. If the wheel's bond holds the abrasive grains too long, they become dull and cannot do a correct grinding job. If the bond does not hold the grains long enough, the wheel wears away too rapidly with a resultant loss in temper, money, and quality of the job. Consultation will quickly determine the proper bond for the wheel that is to solve your particular grinding problem.

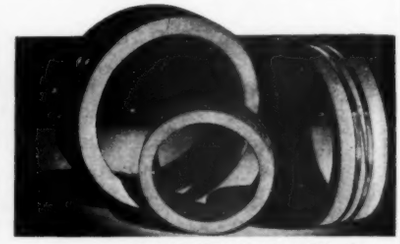
THERE'S A CORRECT STERLING WHEEL SIZE AND SHAPE. Regardless of the volume or contour of the material to be ground, there is a Sterling Grinding Wheel of the proper shape and size to do a complete, satisfactory job. In making this type of wheel, careful manufacture and testing result in a guaranteed method of solving all of your grinding problems. Proper shapes and sizes for your jobs can be readily determined by a Sterling engineer.

Made in various sizes and shapes, Sterling Portable Grinding Wheels are ideal for getting into tight corners to remove excess metal, and for plain holes, threaded holes, special mounting recesses, etc.

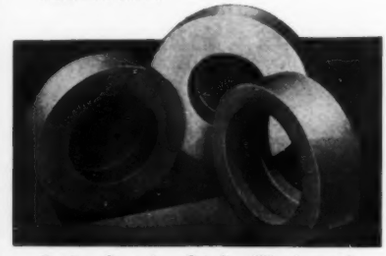
For Blanchard, Diamond, Pratt & Whitney, Hanchett, Capitol and other surface grinders, the Sterling Patented Segmental Wheels provide a Superior means of doing surface grinding jobs.



Sterling Internal Grinding Wheels make possible slight removal of material and an extremely high, smooth finish. The correct proportion of grain and bond, plus a special, vitrified process provides a mirror-like finish.



Sterling Solid Surface Grinding Wheels in ring form are still popular as fast cutting units for accurate, high finish, and for clean cool life that produces low cost results consistent with your low production needs.



Sterling Centerless Grinding Wheels permit an important reduction in time of development of close tolerance cylindrical surfaces. By the creation of such wheel structures, Sterling economically speeds up production.

Sterling Cut-Off Wheels cut quickly and cleanly through hardened steels, marble, granite, tile and many other substances. These wheels do an economical job, and will cut bar steel to within 0.002",

A complete outline of all Sterling Grinding Wheels is given in Catalog No. 40A, recently issued. Also included are prices, interesting tables and data. This is an important, 80 page book that should be in the files of every executive for quick reference whenever grinding problems must be quickly solved. Everyone interested in speeding up our country's war effort should have this important grinding authority on his desk at all times. It will be sent to responsible inquirers who write to us on their company stationery. There is no cost or obligation, of course.

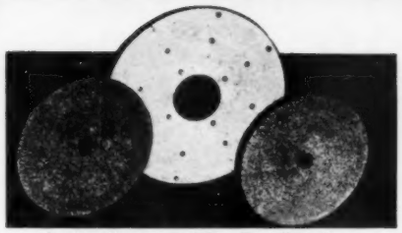
CHECK THESE SUGGESTIONS FOR SAFER, FASTER, WARTIME PRODUCTION:

See that your grinding equipment is in good shape at all times . . even Sterling Grinding Wheels cannot give good service on grinders that are not in good repair.

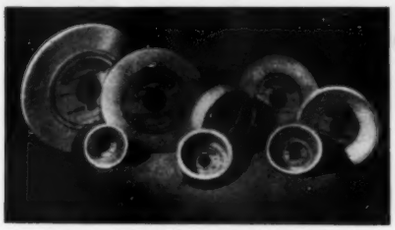
Be certain that your grinding wheels are not being run faster than their recommended speeds, and make it compulsory for all workmen to wear goggles on every grinding job!

Check your equipment with the standard procedure outlined in the Safety Code Book issued by the American Standards Association . . we will glaly send a copy upon request.

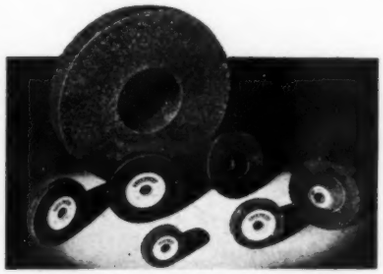
ING WHEELS *Production . . .*



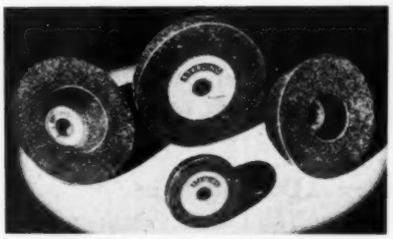
Sterling Nut Inserted Disc Type Wheels are available in a wide choice of grains, bonds, sizes, and nut spacing, to fit the back plates of your present equipment.



Tool room grinding demands specialized wheels built to the needs of each individual job. For quick, clean-cutting action on any alloy, specify Sterling WW Sterlith Vitrified Wheels and be certain.

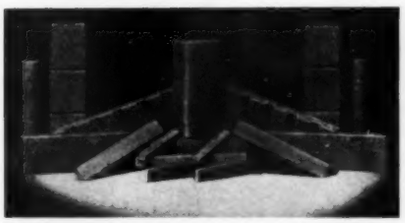


Sterling High Speed Grinding Wheels, shaped to the particular demands of your jobs, offer an economical, fast, trouble-free solution of problems incident to the shaping and finishing of unusual alloys.

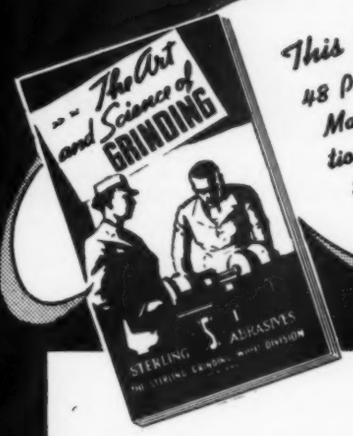


The necessity for rapid and accurate weld finishing makes these Sterling Weld Finishing Wheels popular. Under the stress of production demands, Sterling Wheels solve all types of weld finishing problems.

For fine commercial finish and volume production, these Sterling Grinding Wheels are used for such materials as cast iron, bronze, and steel sleeves, and adapt themselves to cylindrical grinding, removing .0035" easily.



For rubbing or grinding operations on which circular wheels cannot be used or on which metal removal is slight, Sterling Abrasive Bricks and Sticks are widely used. They are made in handy sizes and shapes.



This Free 48 Page Book Answers Many Important Questions Directly Related to Speedy Wartime Production. Send for It!

Here are a Few of the Many Questions this Book Answers:

- How many kinds of manufactured abrasives are there?
- How many kinds of grinding wheels are there?
- For what kinds of grinding are manufactured abrasives best adapted?
- What is a combination abrasive grain?
- What size grains are in greatest demand?
- What are some of the bonds usually used to obtain different grinding results?
- How are grinding wheels dressed?
- When does a wheel cut freely?
- What is the effect of too slow or too high a wheel speed?

Check, Sign, Attach the Coupon to your Letterhead and Mail!

ASK FOR STERLING FREE ENGINEERING SERVICE!

Wartime demands have made it more imperative that correct grinding wheels be used in all kinds of manufacture. To solve the many problems that arise every day, a Sterling engineer will gladly call at your plant, study your grinding wheel requirements, and make necessary recommendations regarding the use of new Sterling Grinding Wheels in your department. Ask for this service; it is offered without cost or obligation.

The Sterling Grinding Wheel Division,
Tiffin, Ohio.
Gentlemen—Please send me the following:

- ☐ "Art and Science of Grinding"
- ☐ Safety Code Book on Proper Grinding Proce
- ☐ Sterling Catalog No. 40A.

Name _____
Company _____
Address _____
City _____ State _____

· STERLING ABRASIVES ·

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Mail This Coupon Today!

STRENGTHEN YOUR CONNECTION with THE INDUSTRIAL DISTRIBUTOR

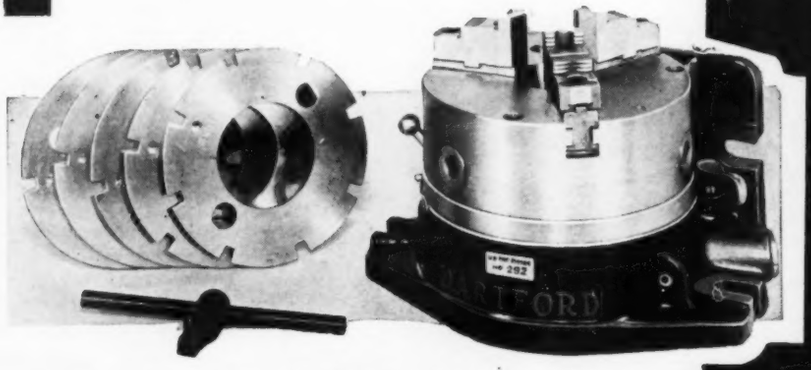
ALLEN'S MARKETING PARTNER for 31 years!

YOUR DISTRIBUTOR stands in with the biggest supply-sources. He's the first and foremost taker of mill supplies. The value of his buying connections—made solid by essential services to the producer—he passes on to you in this emergency.

He goes further afield than his factory suppliers in getting the goods for "MUST" orders. He picks up badly needed items from idle reserves far and near. He rations small but precious surpluses to avert the shortages that mean shut-downs.

Never was it so urgent for you to make the Distributor *your* Procurement Agent. He gets ALL the hollow screws we make and your own Allen Distributor gets *all we can put through* for you!

THE ALLEN MANUFACTURING COMPANY, HARTFORD, CONNECTICUT, U. S. A.



If you have a problem in effecting savings in set-up time on indexing work and getting production out of your machine tools—investigate the possibilities offered by the Hartford Super-Spacer.

With this new and better spacing device you can increase both speed and accuracy of indexing on milling, drilling, slotting and planing operations. A holding capacity, limited only by the capacity of the device itself, assures maintained accuracy under heavy cuts.

A time and money saver in the tool room or on the production line, the Hartford Super-Spacer provides the means to get maximum production from your present tools at minimum cost. All possibility of error is eliminated by mask plates.

INVESTIGATE IMMEDIATELY

Now is the time to speed up production with the Hartford Super-Spacer. It will pay you to get all details today.

Speed up indexing on millers, drills, slotters and planers with the

HARTFORD SUPER SPACER

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT

The SUNNEN PRECISION HONING MACHINE
is Helping to Speed Up DEFENSE PRODUCTION by Handling Jobs Like These FASTER, More ACCURATELY

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Molded Composition (Bakelite) Pulleys. Molded composition is a difficult material to machine but it can be easily honed to a smooth finish.

Stone Lettering Air Hammer "Sunnen honing does in five minutes what it took 20 minutes to do by lapping."

"Produced an extremely accurate and glass-like finish."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Bushings for Automatic Drinking Fountain "Saves buying new expensive production equipment."

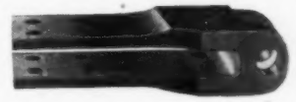
Drill Jig Bushing "Increases sales appeal of product."

"Strict alignment maintained between two holes."

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Honing was used to correct errors of previous machining operations and to obtain a highly-polished surface finish.

Hardened Steel Parts. Honing is used to remove burrs caused by the flash of a punch press operation.



Mild Steel Clevis. Honing was used to correct errors of previous machining and maintain true alignment of the two bearing surfaces of this clevis.

Hardened Steel Gears. Honing used to remove any distortion after hardening and to selectively size the gears to uniform diameters.

Miniature Model Airplane Cylinders "Eliminates expensive machine set-up."

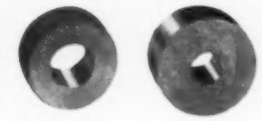
Taper removed at a rate of 80-90 per hour from automobile distributor shaft gears.

Better finish and alignment maintained on yoke for compressor

Aluminum Aircraft Link "produces high finish without bell-mouthing"

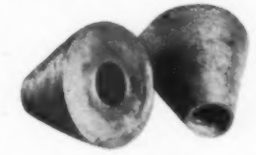
Hardened Steel Inner Bearing Race honed to .00005" limit. Surface finish improved; errors of out-of-roundness eliminated.

Aircraft Valve Tappet Roller. 4-Micro finish.



Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness

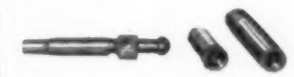
Compressor roller "maintains .00005" limits; increased production over 100%.



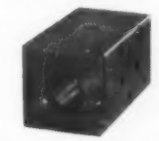
Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Sunnen honing corrected distortion caused by hardening for manufacturer of small parts.

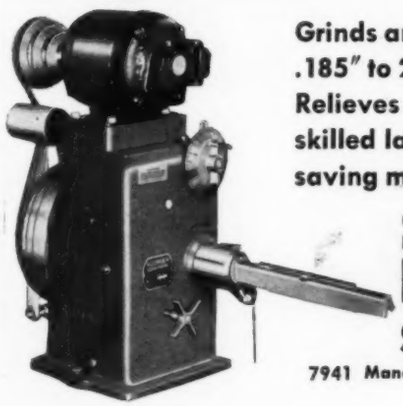
Crankshaft Grinder Bracket "Replaces expensive machine set-up for short-run production"



Airplane Engine Parts accurately honed to a super-smooth finish.



Saved time in producing a smooth accurate finish on this bronze remote control valve body



Grinds and finishes internal cylindrical surfaces from .185" to 2.400" with guaranteed accuracy of .0001". Relieves big internal grinders. Does not require skilled labor! Can be set up in less than a minute. Is saving money, increasing production and improving quality for hundreds of manufacturers handling important defense orders.

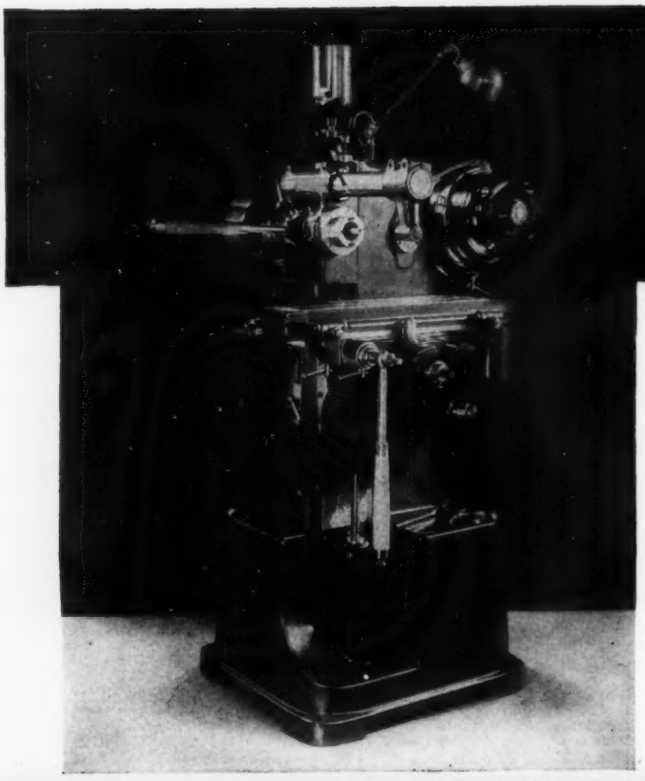
SUNNEN

SUNNEN PRODUCTS CO.

7941 Manchester Ave., St. Louis. Detroit Office: 321 N. Lafayette Blvd.
Canadian Factory: Chatham, Ontario

Write for FREE 8-Page Bulletin

giving complete information or, if you prefer, a Sales Engineer will be glad to call with his demonstrator and show you what this machine can do on your job.



THE NICHOLS HAND MILLER

» A modern, convenient machine for the volume production of accurate parts . . . .

In the "NICHOLS", the usual features of the hand miller have been combined with a ruggedness of design and construction which makes it a truly production machine tool offering high cutting speeds, maintained precision and long life. A wide variety of operations can be handled at top speed and reduced cost as compared with the same work produced on larger slower machines.

Because of its precision, great versatility and quick set-up, the Nichols Hand Miller is particularly adapted to tool room requirements. Its wide use in this class of service by leading manufacturers is evidence of its recognized value and suitability in meeting the requirements of modern shops.

•

Capacity: Longitudinal Feed, 10"; Transverse Feed, 7"; Vertical Feed of Knee, 13½"; Vertical Movement of Head, 4½", Working Surface of Table, 6½" x 21"; Spindle Speeds, 100, 200, 600 and 1200 R.P.M.

Send for Illustrated Bulletin giving Complete Information

W. H. NICHOLS & SONS *Waltham, Mass., U.S.A.*

For Better Uniforms Demand These Labels!

ARMY TWILL BY REEVES SANFORIZED* MADE TO GOVERNMENT SPECIFICATIONS

REEVES Glengarrie POPLIN

REEVES ARMY TWILL SCORES A HIT!

With men who handle machinery, it's stamina and wear that count in uniforms. So specify this famous fabric when ordering your uniforms.

Reeves Army Twill passes U. S. Govt. tests for strength, endurance and color-fastness. For fabric vitality it's a leader in its field!

For matching shirts, GLENGARRIE POPLIN is equally popular. Both fabrics available in favorite colors — are Sanforized* against shrinking.

*Fabric shrinkage not more than 1%. (U. S. Government Test CCC-T-191-a)

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OVER 45,000,000 yards of Reeves Army Twill sold to the U.S. ARMY

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STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed-Center Multiple Drilling Heads

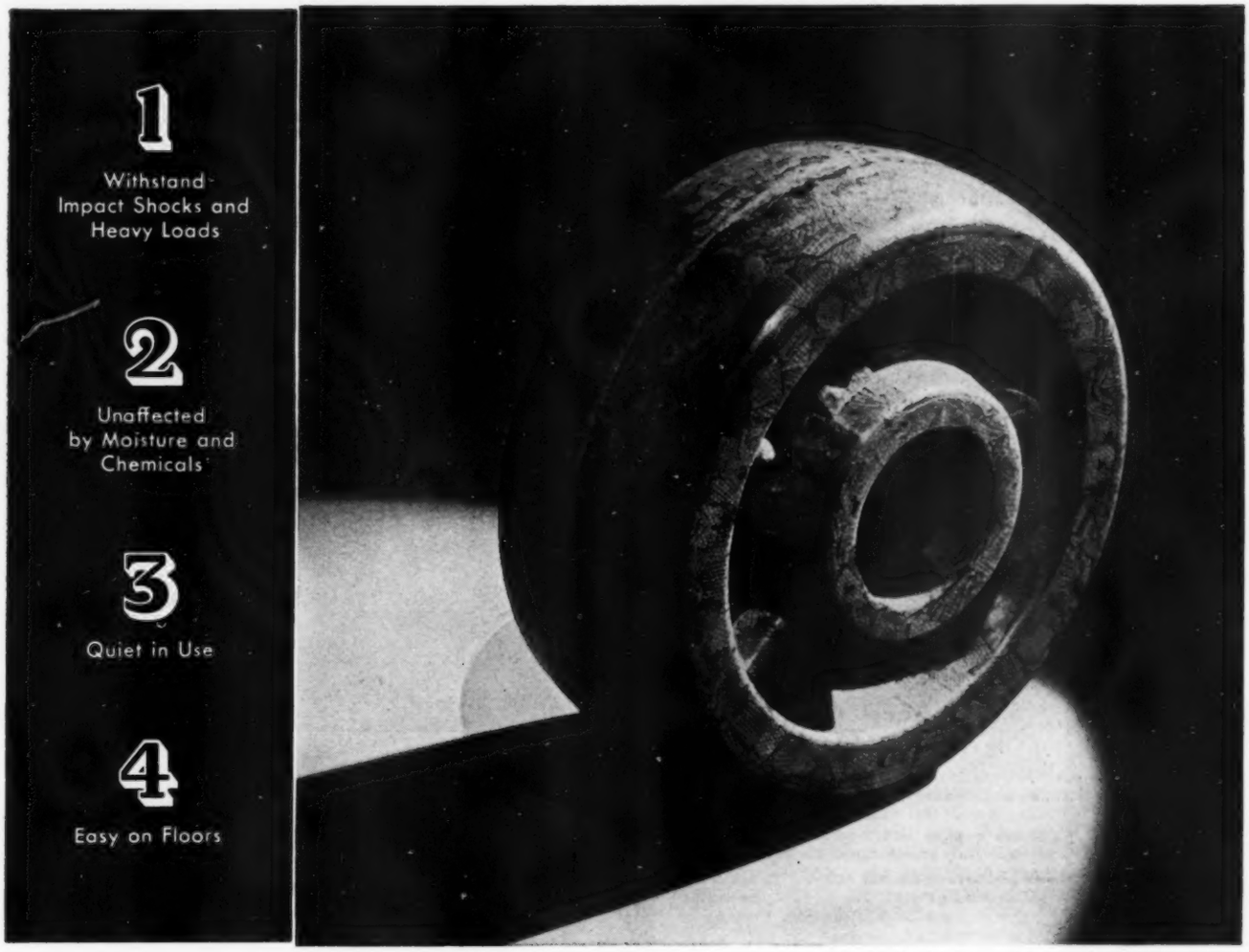
Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

Longer Service for Factory Trucks —Less Maintenance for Floors

WITH TRUCK WHEELS MOLDED FROM "BAKELITE" PLASTICS



Truck wheel fabricated by Synthane Corporation.

FOR YEARS, factory truck wheels have been produced entirely from metal and other materials. However, metal wheels were noisy in operation, tough on floor finishes, and frequently were damaged when subjected to hard knocks. Some of these difficulties were overcome with rubber tires, which, however, deteriorated rapidly when continuously exposed to oil, moisture, or chemicals.

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Unit of Union Carbide and Carbon Corporation

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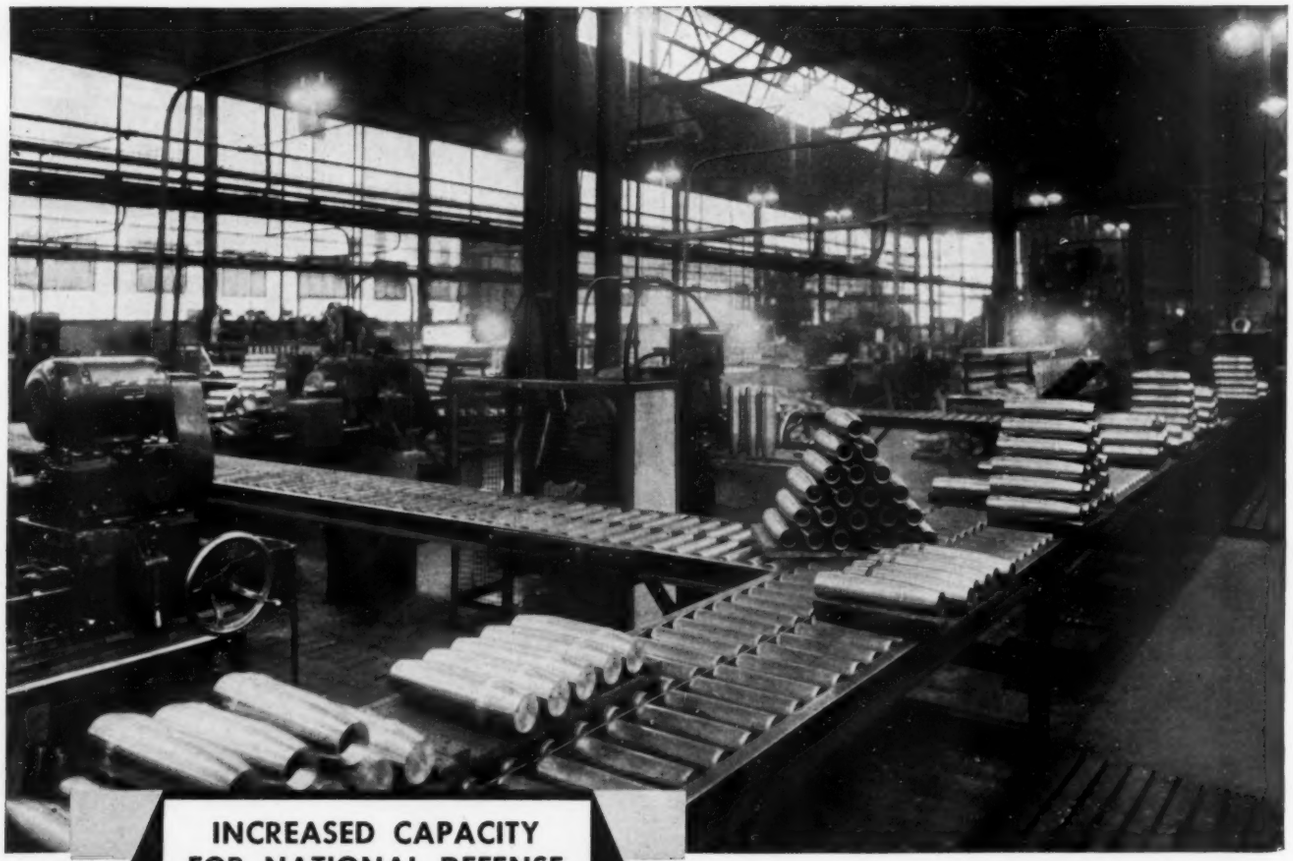
PLASTICS HEADQUARTERS

MEN . . . MACHINES . . . AND MATHEWS



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THE 9th ANNUAL DIRECTORY NUMBER

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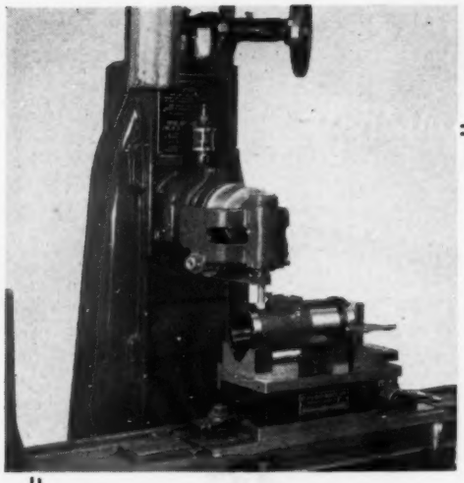

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for quicker set-ups on a wide range of work

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These highly accurate, completely assembled units, with precision bearings throughout, are designed for the most accurate grinding service on gages, tools, dies and other exacting work of this kind. They can be attached quickly and easily and eliminate time ordinarily wasted in set-up on surface grinders.

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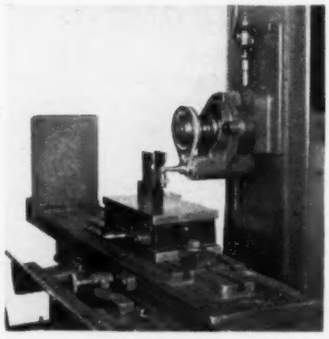

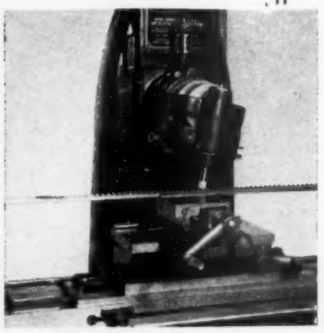

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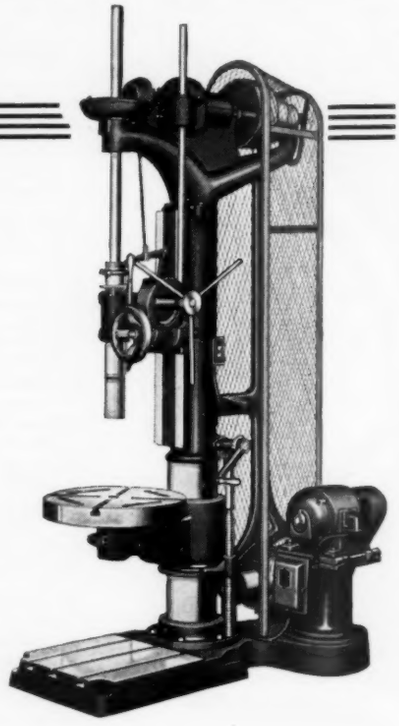

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IT'S a TWO minute job to change H & G Insert Chasers. A NEW set is installed in the carriers with no more bother than putting a new blade in a safety razor. This feature makes for uninterrupted production — vitally important when threading the tough alloys now so largely specified on all defense equipment.

When chasers get dull a new set is immediately substituted and production continues. Non-productive time for both operator and machine is practically eliminated—decreasing costs and increasing earning power. Like gaining an extra hour every day.

The threads cut establish new standards for quality and accuracy. The low chaser cost and superior wearing qualities provide a lower tool cost per thousand pieces.

H & G Insert Chaser Die Heads are available in a wide range of styles and sizes.

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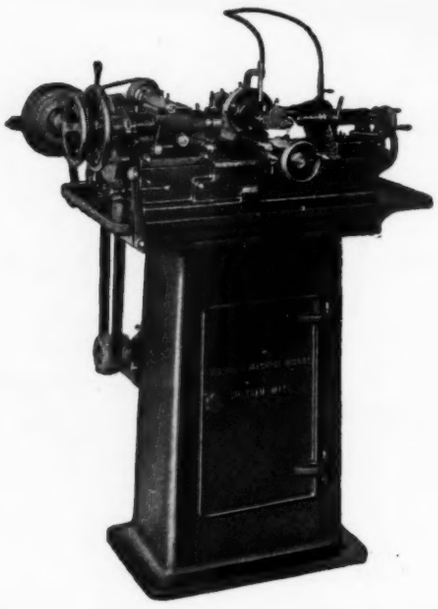

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A semi-automatic machine for production or tool room service. It is best adapted for work 2" in diameter or smaller. Special equipment for short multiple cutter work with cam shaft control can be furnished. A cutter head for internal work can also be supplied.

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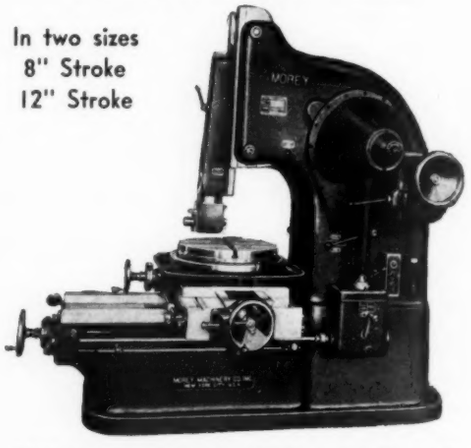

Timken tapered roller bearings for the main spindle—all others anti-friction

Accurate—simple for toolroom manufacturing.
Self-contained motor drive.

Ask for Circular No. 726.

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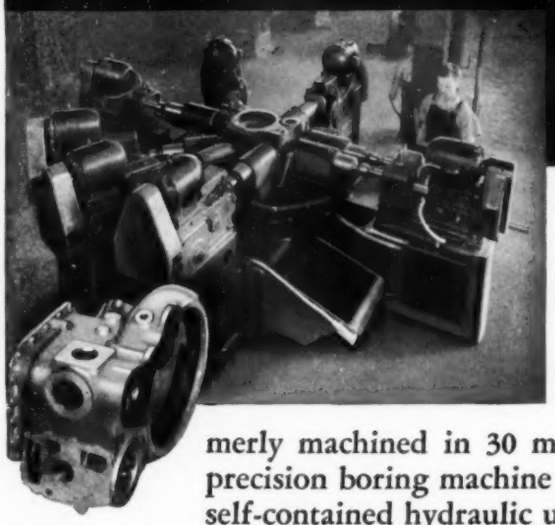
Production increased 6 times With Precision Boring Machine



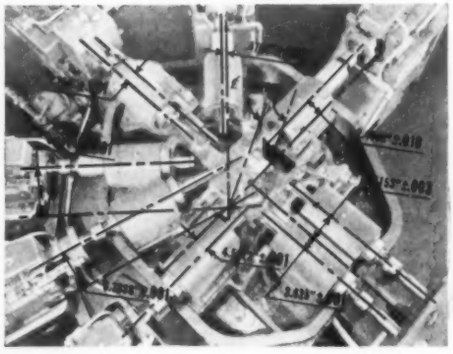
10 More Parts per Hour While Maintaining Close Limits of Machining

This aluminum-alloy accessory housing was formerly machined in 30 minutes. With this seven way, nine spindle unit-type precision boring machine the time per piece is reduced to 5 minutes. Standard self-contained hydraulic units are used. These can easily be re-arranged to meet future changes in the accessory housing. For more unit information and data write for our 75 S.H. folder.

Diameters Held to ± .0005" - Location ± .001" - Angular Location ± 15 Seconds

A prominent airplane engine manufacturer (name on request) eliminated a lot of trouble in getting the accuracies shown to the right. The nine precision spindles work simultaneously without possibility of error resulting from individual settings and numerous gaugings.

In this type of precision boring machine the precision is incorporated in the boring tool design. Tool is guided in individual bushings mounted close to workpiece. Micrometer adjustment provided on each tool simplifies setting tools to accurate diameter. After properly located, guide bushings are doweled and securely bolted in place. Self-contained hydraulic units act as feed and drive equipment.

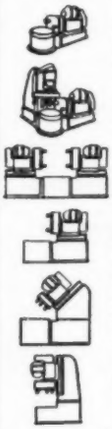


These are the tolerances specified on this job. Yours may be tougher or not, but no matter what your problem, perhaps a unit-type machine can be designed to obtain your specified accuracies while increasing your production.

One Operator Bores 9 Holes

As in this case, unit type machine tools increase the productivity of the operator. After a few hours instruction an unskilled man can operate a unit-type machine. Usually his work consists only of loading the part, pushing a button or two, and unloading.

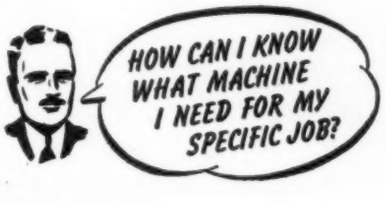
You Can Save From 20 to 35% with Unit-Type Machine Tools



Initial cost of these special machines is lower because drawings and patterns are available. You save engineering and pattern costs on complete feed and drive units.

Boring, drilling, reaming, tapping, and milling operations can be done simultaneously. Best combination to suit your production is available. And, future changes in your part design won't cripple the machine—units can readily be re-arranged to accommodate changes.

FREE BOOKLET. This bulletin gives complete information covering construction and application of a 3 H.P. unit. Write for your copy today . . . ask for the 75 S.H. folder.



DELIVERIES are delayed when ordering is delayed, and since it takes longer to determine the correct machine for your specific job, than to order standard catalog equipment in quantity, we urge you to investigate the possibility of adapting unit-type machines to your production — today.

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Automobiles — Airplanes
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Not a catalog, but a set of four bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a tooling or production set-up that you can use today — valuable file information for tomorrow. Write for bulletins A.M. 30 through A.M. 34.

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Ten, twenty, a hundred thousand excellent threads without grinding chasers! Compare that with the average production with solid dies, often only a few thousand pieces per grind. Class 3 fits in any material, on threads from 1/16″ to 3/16″ in diameter, in pitches as fine as 100 per inch. Compare Geometric EJ5's adustability, accuracy and uniformity with any solid die! On all sorts of small diameter threading, for eyeglasses, business machines, fine instruments, cameras, etc., Geometric EJ5 Solid Adjustable Die Heads have set new records for long run production. EJ5 uniformity and adaptability make it possible to cut Class 3 fits—with any set of dies. No need to waste time selecting the most accurate of a group of solid dies!

Geometric EJ5 Die Heads have every advantage of removable, easily adjustable chasers in a small, compact, easily used die head. Let us send you details and specifications to show you the way to success—and profits—on small diameter threads.

THE GEOMETRIC TOOL COMPANY

New Haven, Conn., U. S. A.

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Consult MURCHEY ON YOUR ARMAMENT PRODUCTION THREADING...

Speed, accuracy and savings are being consistently realized in thread production on all kinds of ordnance work with Murchey Threading Tools.

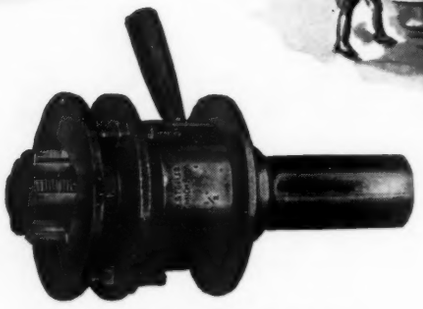
Ability to stand up in long hard service and *produce* under exacting schedules has long since been proved.

Murchey Tools and the experience behind them can be depended on to meet the urgent problems involved in National Defense. Ask us for assistance on your threading jobs.

Speed up shell and bomb production . . . .

Murchey Single and Double Head Threading Machines provide features for fast, accurate tapping and chamfering on the nose of shells and bombs. Send at once for details.

Murchey manufactures all types of Self Opening Die Heads, Collapsible Taps, Bolt and Pipe Threading Machines and Pipe Cutting Off Machines.



MURCHEY TYPE "M" COLLAPSIBLE MACHINE TAP

This Murchey Tool assures fast, accurate straight thread production and accurate thread lengths. It provides instant and positive collapse, is adjustable for thread size and can be depended on for speed, accuracy and long life.

MURCHEY TYPE "G" SELF-OPENING DIE HEAD

This non-rotating tool for use on hand screw machines assures production of fine quality threads on long runs. Opening is positive and and instantaneous; closing is automatic or by hand. Provision is made for size adjustment. The Type "G" is a fast, accurate, sturdy tool assuring savings on a wide range of work.

The Type "CO" Die Head is similar in all respects to the Type "G" except that it is designed as a revolving head for rotating spindles. Chasers are interchangeable between the Type "G" and Type "CO".

Murchey MACHINE & TOOL CO.
.....DETROIT, MICHIGAN

3 VITAL POINTS

for buyers of **GAGE BLOCKS** *to consider today*

1. How long has the manufacturer been in businesss—

This is a point worth serious thought. A gage block is more than a mere piece of highly finished steel. It takes years experience—requires highly skilled help — and thorough knowledge of the physicial properties of steel and its reaction to heat treatment to manufacture accurate gage blocks. Webber has a trained organization backed by more than ten years experience in the development and manufacture of Gage Blocks.

2. Is the manufacturer going to be in the gage business after the emergency—

Webber has an established reputation for manufacturing accurate gage blocks in a full range of sizes to meet varied demands. Here is a concern which started in a small way and grew steadily year after year, the high quality of its products being responsible in a large measure for its success. Webber Gage is no "War Baby" and will be in business long after this emergency is forgotten.

3. What has manufacturer done to anticipate emergency demands—

Webber has not only increased its manufacturing facilities by 50% but has more than doubled its floor space. This new plant is a model of modern construction — designed for maximum daylight — thoroughly insulated—scientifically air conditioned —and heated for maintaining uniform temperatures during all phases of manufacture.

Thus Webber Gage has an impressive service record — a wide reputation for accuracy — and the facilities and organization to meet your gage block needs.

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To anyone sending required priority certificates.

PRICES—Set 81-B.....$235.00
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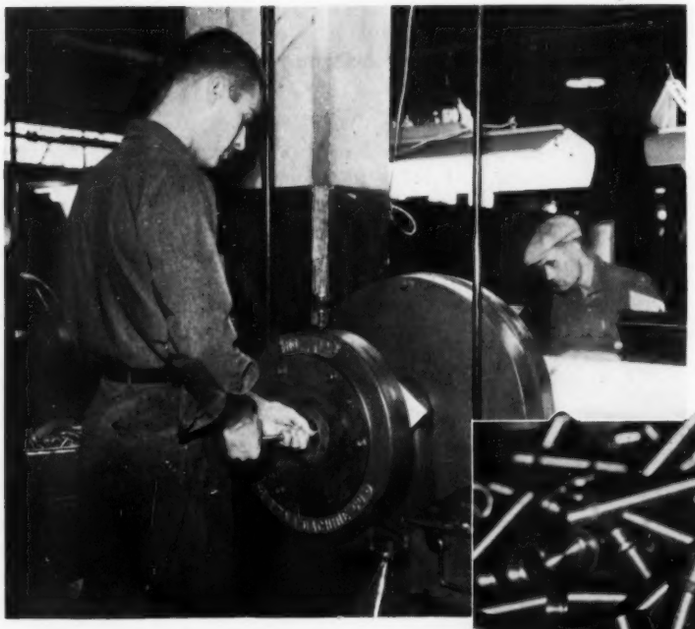
Etna Swaging Machines

are ideal for defense production!



...HERE,

two No. 72 ETNAS are swaging copper bands on 20 m.m. shells at the rate of

900 PER HOUR

● The use of standard ETNA Swaging Machines for direct defense production is demonstrated by these two No. 72 ETNAS (one shown) employed by a prominent mid-western manufacturer for turning out 20 m.m. shells. The operation consists of swaging a narrow copper band around the shell . . . *production is 900 per hour!*

This clearly shows one of the many points of superiority embodied in swaging by ETNA. These units, helping to make shells now, can be used for normal work later! In other words, *an ETNA purchased now for defense, is a money-saving, money-making investment for future use.*

If you taper or size tubing or round solids . . . if you have small tubing assemblies, you can save by swaging. Call in the ETNA man for recommendations on your requirements. ETNA Swaging Machines are available in ⅜" to 4" diameter capacities—1" to 18" die lengths. Larger sizes are built to order.

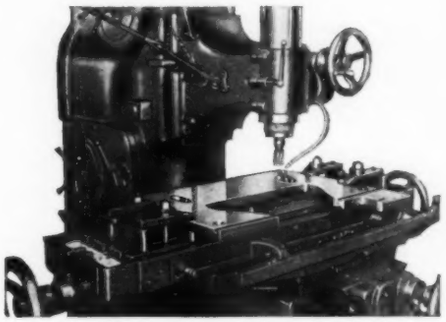
IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY

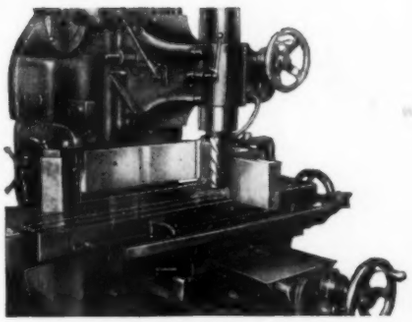
TOLEDO . . . OHIO

Balanced design makes KNIGHT Millers *adaptable to wide variety of work . .*



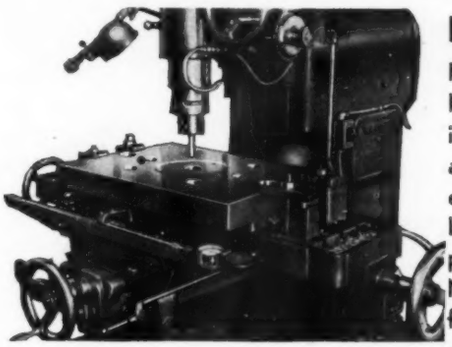
EXAMPLE 1.

LIGHTMILLING: Many operations were performed on the large one-inch steel plate at one setting, including profiling, milling, boring, slotting, and keyway cutting. KNIGHT Miller's wide range of spindle speeds, solid table unit, and ease of handling provide efficient production and accurate results on all of these operations.



EXAMPLE 2.

HEAVYMILLING: A two-inch diameter cutter, six inches long, was used on large forging to remove as much as five-sixteenths inch of stock in some places without appreciable spindle deflection. The forging was machined completely all over and met with rigid inspection for finish and tolerances. You can do tough jobs like this with your KNIGHT Miller.



EXAMPLE 3.

PRECISION BORING: Here a KNIGHT Miller is successfully handling a boring job on an eighteen inch by twenty - nine inch plate, two inches thick. Nine holes, ranging from one and one-eighth inches to two inches in diameter, were accurately bored to limits of plus or minus .0005". Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square, make the KNIGHT Miller ideal for this work.

Read complete details on Balanced Design and other* KNIGHT Miller *features in new catalog

RIGIDITY: Firmness that insures high standards of workmanship and production volume.

ACCURACY: The result of design as well as precision of workmanship and the quality of materials used.

VERSATILITY: Capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.

ACCESSIBILITY: From either a sitting or standing position, the operator always has a clear vision of the job—one set of simple, convenient directional controls, for both hand and power operation, within easy reach.

CAPACITY: Sixteen changes in speed, in either direction, give the spindle ample range to meet a wide variety of requirements.

PRECISION BORING: KNIGHT Millers have the necessary requirements for precision boring of jigs and fixtures, and for accurately locating and boring on a production basis where it is not economical to make special tools.

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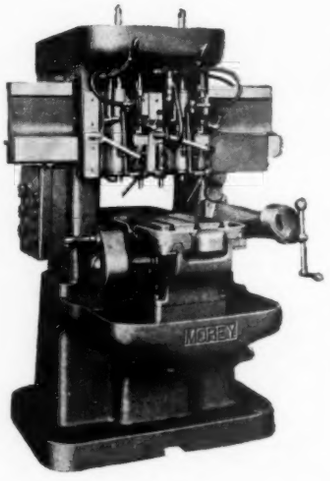

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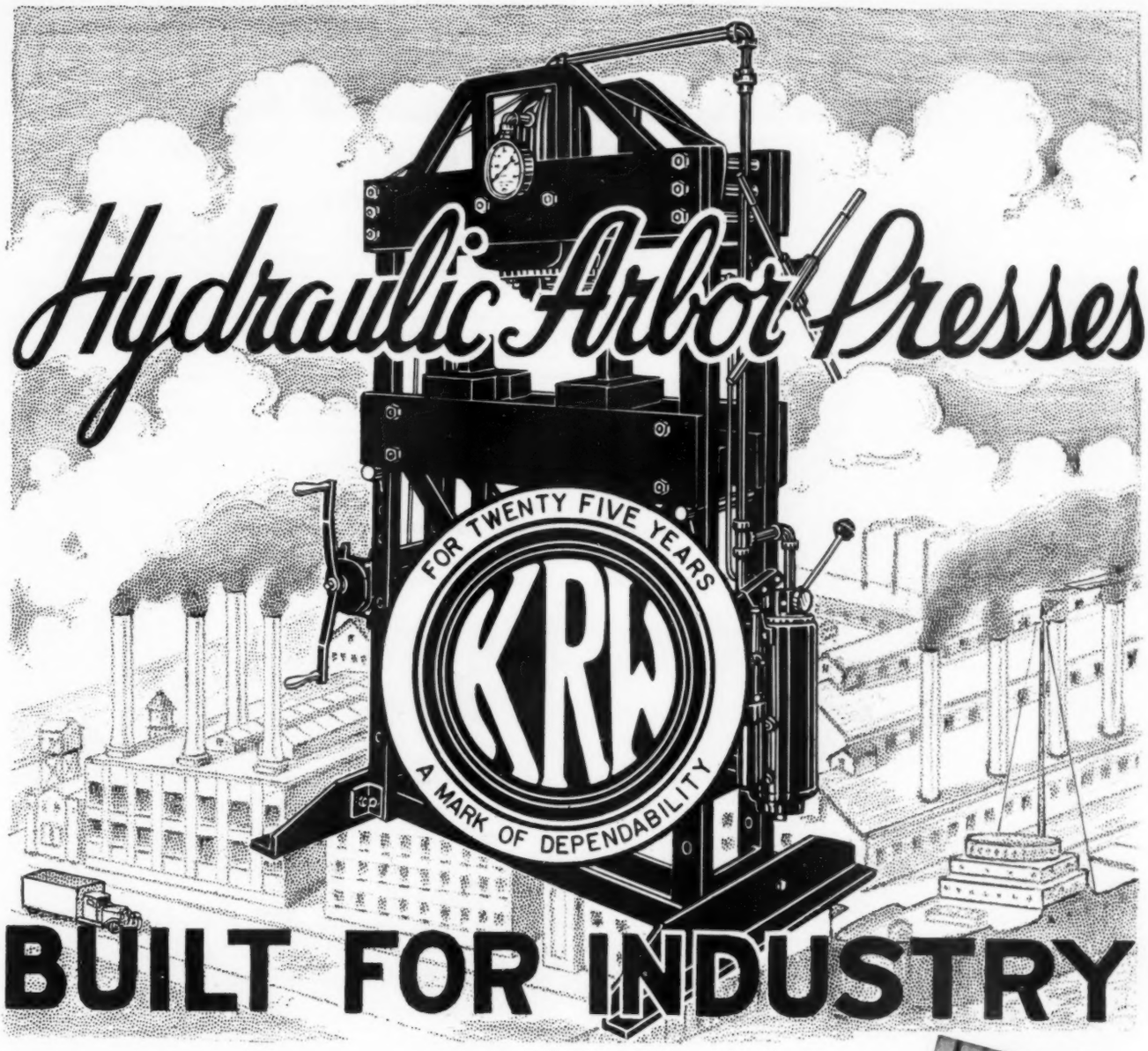

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Cuts stock from 3 inches up—Handles multiple cutting of small bars or shapes . . . . . .

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To insure accuracy and protect against blade damage at times when hard spots are encountered in cutting, friction disc feed is provided. Further protection is assured and weaving and buckling prevented by supporting the blade close up to its rim and by *pulling the blades upward through* the cut. This method of feed and drive also results in lower power requirements and straight cuts under all conditions.

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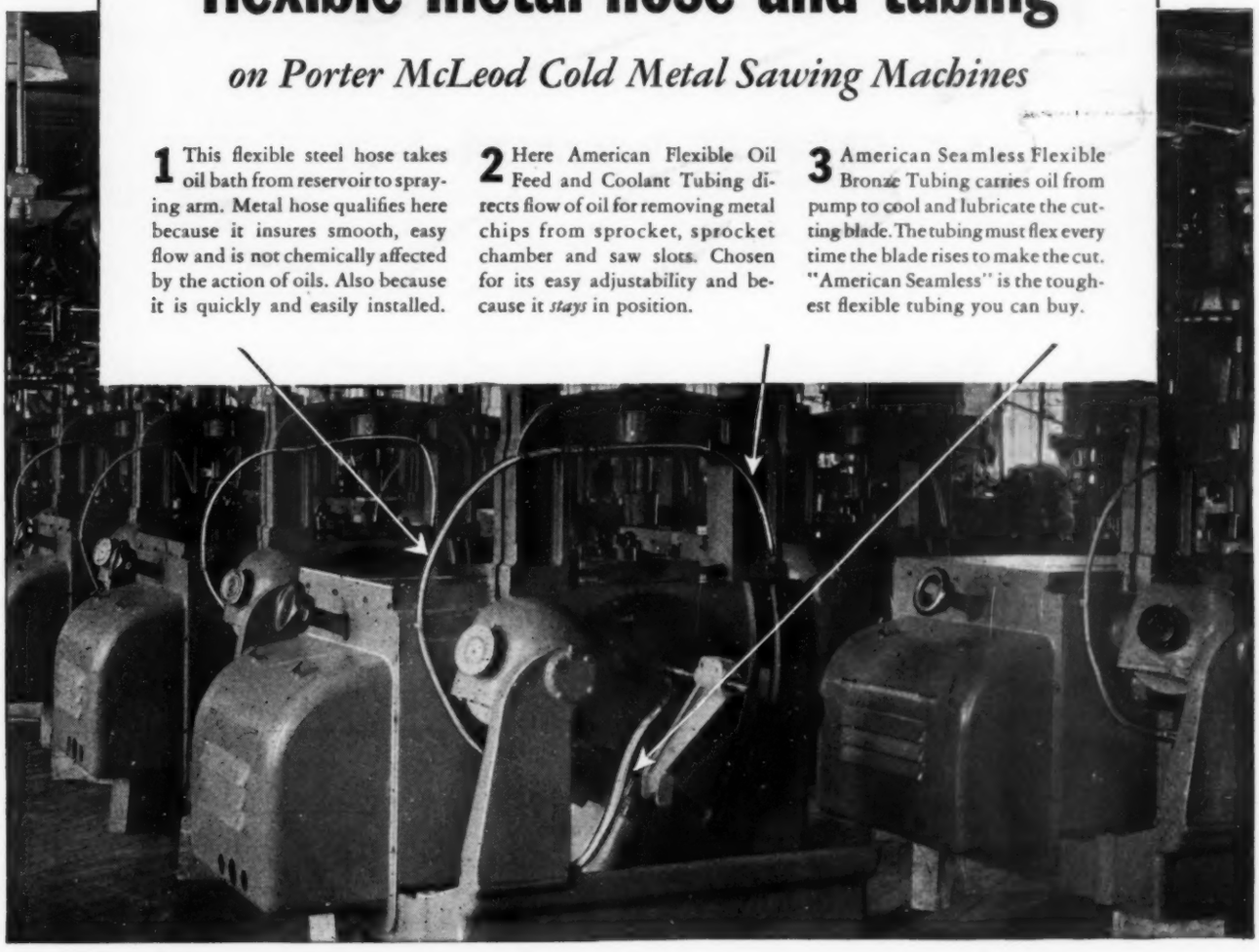
3 American Seamless Flexible Bronze Tubing carries oil from pump to cool and lubricate the cutting blade. The tubing must flex every time the blade rises to make the cut. "American Seamless" is the toughest flexible tubing you can buy.



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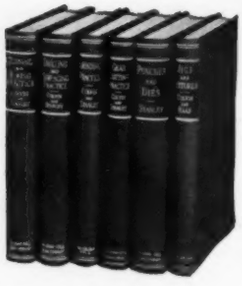

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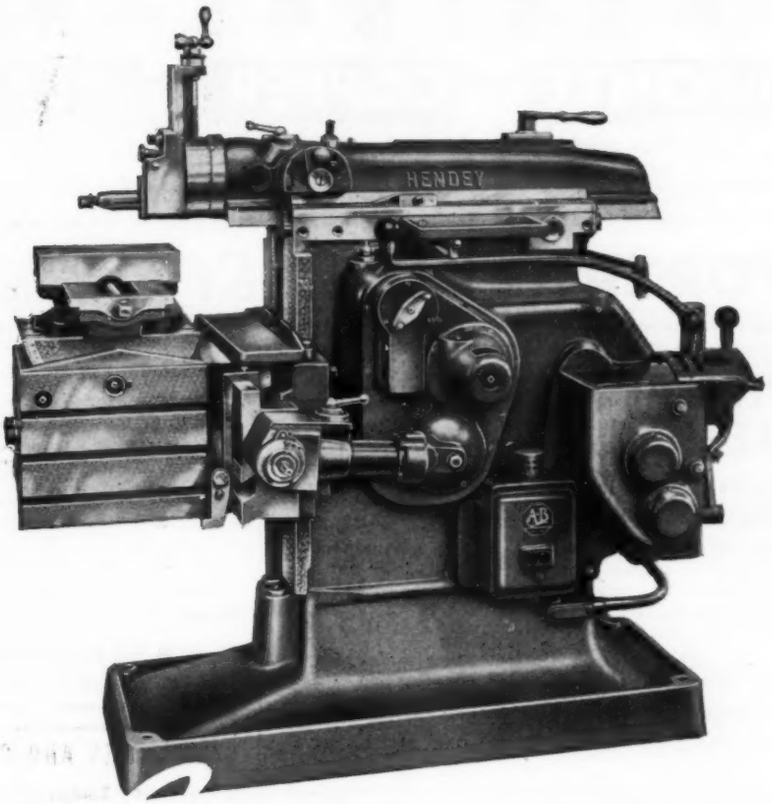

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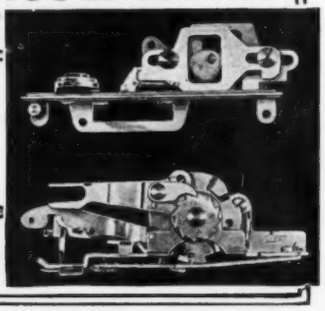

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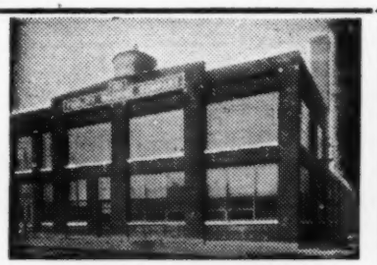

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An unusual opportunity for an energetic and creative young engineer, between ages of 24-35, to work on Bimetal Products. After sufficient training this position will lead to that of sales representative for a progressive company which is between Providence and Boston.
Please give complete information covering age, education, experience, salary, etc.
P-163, American Machinist
330 West 42nd St., New York City

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MACHINE DESIGNER: Position open for first-class machine designer of proven ability, experienced in the design of modern machine tools. This position is steady for the right man. Applicants must be citizens of the United States. Location: Rhode Island. P-155, American Machinist, 330 W. 42nd St., New York, N. Y.

ESTIMATOR, to make time studies on machine shop operations on heavy machinery. Location, vicinity New York. Citizen. P-159, American Machinist, 330 W. 42nd St., New York, N. Y.

MACHINE SHOP FOREMAN — Large manufacturing corporation has opening for head of machine shop. The applicant must be first class tool and die maker and must have experience in planning, and estimating costs. Steady employment, good pay for right man. Answer giving in detail past experience and training. P-161, American Machinist, 330 W. 42nd St., New York, N. Y.

PRODUCTION MANAGER to superintend the manufacture of a large quantity of mechanical time fuse parts. Operation consists of turning, drilling, tapping and broaching. Philadelphia concern. Peace time opportunity. P-164, American Machinist, 330 W. 42nd St., New York, N. Y.

HIGH SPEED STEEL METALLURGIST to take charge of heat treating department of rapidly expanding small tool manufacturer. Steady business now employing about 300 offers exceptional opportunities. Metallurgist must be capable at directing research work in hardening small high speed tools. Age preferred 25-35. Starting salary $4000.00 and bonus. Location Middle West. P-165, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

POSITION WANTED

AUTOMATIC SCREW MACHINE FOREMAN. Thirty-five years experience Brown & Sharpe Davenport Acme Gridley and Cone Machines. Capable estimating layout out cams and designing tools. Thoroughly ground in all phases of modern practice and successful record twenty-five years in charge of modern and up-to-date Automatic Screw machine departments, successful at handling and training help, two years experience on 30 and 50 cal. aroma piercing machine gun cores and R.P. 582 primers, very good reason for making change. Location immaterial. Available at once. PW-162, American Machinist, 330 W. 42nd St., New York, N. Y.

CONTRACT WORK

WORK WANTED—For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on the page Facing the inside back cover.

PATENT ATTORNEY

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

WANTED
for Equipment Wanted see page 132

WANTED
IRON FOUNDRY with MACHINE SHOP
—to produce VALVES—up to 60 Inches!
BUSINESS BROKERS, INC.
120 S. LaSalle St. CHICAGO
Randolph 2557

INVENTIONS WANTED
Practical mechanical or electrical inventions promoted, and carried to manufacture.
Mail all available information to
P. O. Box 217, Denville, N. J.

WANTED—
PRODUCT TO MANUFACTURE
Will purchase patterns, tools, drawings and good will of product discontinued by a large manufacturer due to lack of volume sales.
BO-157, American Machinist
330 W. 42nd St., New York, N. Y.

ALFRED HERBERT LTD.
COVENTRY, ENGLAND
OFFICES AND SHOWROOMS AT — LONDON, COVENTRY, GLASGOW, MANCHESTER, BIRMINGHAM, SHEFFIELD, BRISTOL, NEWCASTLE, CALCUTTA, BOMBAY, SYDNEY, MELBOURNE, OSAKA, TOKIO, BUENOS AIRES
representing a number of leading United States makers of machine tools and workshop equipment can undertake additional agencies.

PROFESSIONAL SERVICES

Machine Tool Designing Engineers
30 Years Experience in Designing Building & Developing Production Machinery & Processing Operations
Automotive — Tractor
Airplane — Munitions
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W. K. Millholland Machinery Co.

LET US LIQUIDATE YOUR FROZEN ASSETS

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Have you an **Industrial Plant,** some **Machinery,** a **Railroad** or other **material** or **equipment** which you would like to **turn into cash?**

We are experts in industrial liquidations

Contact any of our offices, as listed, extending throughout the country, so that we can assist you in your particular problem.

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Found! UNUSED MACHINE HOURS

This is **No. 8** of a Series on Engineered Machine Tool Rebuilding.

The chips are down. There is no time to waste now.

Every plant must be certain that it is at the peak of its production . . . exacting every possible working hour from its machines. Every plant must check carefully to determine whether its output can be increased by speeding up . . . motorizing . . . or even redesigning its equipment.

The Simmons Machine Tool Corporation is helping industrialists all over the country to get unused hours out of their machine tools through *Engineered Rebuilding*. It may be that "The Simmons Way" can help you step up production in your plant.

BULLARD MULT-AU-MATIC getting final adjustments after rebuilding in the Simmons plant. This machine, one of the most intricate of the larger machine tools, was completely dismantled and rebuilt from the ground up. New parts were supplied to replace those badly worn, broken or missing.

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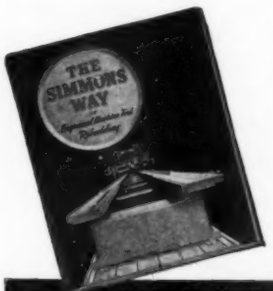

This 58-page book, "The Simmons Way of Engineered Machine Tool Rebuilding," will show you how to make the most of what you have. A request on your company's letterhead will place it on your desk.

Write for a Rebuilding Estimate on YOUR Machine Tools.

SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, N. Y.
NEW YORK OFFICE: 149 BROADWAY

ReMANUFACTURED MACHINE TOOLS

—ORIGINATED BY US—

Reg. U. S. Patent Office

BORING MACHINES
No. 2—5" Bar Barrett

BORING MILLS
30" Bullard
42" Gisholt
14' Sellers motor drive

DRILLS
1, 2, 4 spdl. Henry & Wright
No. 2—4 spdl. Leland-Gifford, Motor Spindles with Power Feed
1, 2, 4 spdl. Leland-Gifford
No. 2—1 spdl. Colburn
No. 5-D—4 spdl, Moline Hole Hog
No. 17—2 Spdl. Foote-Burt Rail
No. 4—5 spdl. Foote-Burt Rail
No. 1 Baush Multiple
No. 3 Baush Multiple

RADIALS
5' Western Heavy
8' Western Heavy

GEAR CUTTERS
No. 6, 61, 62, Fellows
No. 12 Barber-Colman
No. ½ Pfauter Hobber, M.D.
No. 3—26" Brown & Sharpe
No. 4—48" Brown & Sharpe
No. 5—48" Brown & Sharpe
No. 6—72" Brown & Sharpe
No. 6-A—72" Cincinnati
96" Newton Spur Gear
No. 36BM G&E Bevel Rougher

GRINDERS
(See page 130 special advertisement Hill-Clarke Cylindrical Grinders)
No. 40 Bryant Plain, Wide Wheel Oscillating
No. 2½ Universal (Bath Type)
No. 5 Springfield Planer Type Surface
No. 2—18" Gardner Disc

LATHES
3½"x36" Fitchburg Lo-Swing
3½"x60" Fitchburg Lo-Swing
3½"x108" Fitchburg Lo-Swing
8"x60" Fitchburg Lo-Swing
No. 4 AC Leblond Auto. Duplex Crankshaft
18"x6' Bradford Geared Head
20"—40"x10' Rahn-Larmon Geared Head Sliding Bed Gap
21"x8' LeBlond Universal
21"x10' LeBlond
24"x22' Lodge & Shipley, taper attachment
26"x10' Bridgeford
30"x12' Whitcomb-Blaisdell

MILLERS
No. 3 Becker-Brainard Plain Miller
Model CS Becker Vertical Continuous Rotary table
5" P&W Automatic
24"x24"x12' Ingersoll Adj. Rail
24"x20" Ingersoll Dbl. Faced
36"x36"x12' Newton Duplex
38"x44x20' Ingersoll Slab
No. 1 Smalley-General Thread

PLANERS & SHAPERS
24" Mark Flather, S.P.D. Shaper
24"x24"x6' Powell
24"x24"x6' Rockford
24"x24"x12' Gray
30"x30"x8' American
30"x30"x8' Powell
36"x36"x12' American
36"x36"x18' Cincinnati
42"x42"x14' Gray
48"x48"x10' Niles-Bement-Pond
48"x48"x12' Gray, Reversing M.D.

PRESSES
No. 303 Bliss Straight Sided
No. 58 Toledo Nosing
No. 42½ Pels Beam Shear

TURRET LATHES
21"x8' LeBlond Universal
2¼"x26" Greenlee, A.C. & B.F.
3¼"x40" Greenlee
3"x36" Jones & Lamson, 2 spdl.
3"x36" Pratt & Whitney, A.C. & B.F.
21" Gisholt, 3¾" H.S.
24" Steinle, 6¼" H.S.

MISCELLANEOUS
No. 7 Burr Keyseater
60" Quickwork Rotary Shear
No. 4 J. N. La Pointe Broach
6½" Avey Metal Band Saw
No. 12 Bignall & Keeler Pipe Machine

HILL-CLARKE MACHINERY COMPANY
651 Washington Blvd. Chicago

MOREY DEPENDABLE USED MACHINES

Ingersoll 24"x24"x12' Slab Miller
P & W 12"x48" Thread Miller
Lees Bradner No. 3 Thread Miller
Cincinnati 18" Auto. Duplex Miller
McCabe 24"x42"x14' Double Spindle Lathe
Bridgeford 36"x40', 15 speed Geared Lathe
Sellers 42" Car Wheel Lathe
Foster No. 1F Fastermatic Turret Lathe
Natco No. 11 and No. 12 Multi Spindle Drills
Natco 13H Hydraulic Multiple Spindle Drill
Barnes No. 3 Horizontal Drill
Sipp 3 spindle High Speed Drill
Gleason 24" Bevel Gear Planer
Gleason 37" Bevel Gear Planer
Gleason 6"-11"-18" Bevel Gear Generators
La Pointe No. 2 and No. 4 Broaching Machines
Landis 3½" Internal Hydraulic Race Grinder
Heald Nos. 55-60-65 Internal Grinders
Bath No. 2 Universal Grinder
Norton 6x32 Plain Grinder
Landis 10x52 Plain Grinder
New Britain No. 22 Automatic Chucking Machine
Bliss No. 31 Geared Fly Wheel Press, M.D.
Bliss No. 5 Back Fly Wheel Press
Bliss No. 73½ Straight Side Press
Bliss No. 160 Single Stroke Crank Press.
Cleveland ⅜"; ½"; ⅝"; ⅞"; 1¼" Model "A" Automatic Screw Machines
Espen Lucas No. 138 Cold Saw—Cap. 12" Rd.
Newton No. 200 Cold Saw—Cap. 11" rd.
Cochrane & Bly No. 5 and No. 6 Cold Saws
Cleveland No. 1 Plate Planer—21' capacity
Woodward & Powell 30"x30"x8' Planer—single head
Acme 1" All Steel Upsetter
Ajax 3" All Steel Upsetter
Saunders 8"-18" Pipe Threader, M.D.

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MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

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14"x6' Hendey Grd. Hd. S.P.D. T.A.
16"x8' South Bend Cone Drive, Q.C.
20"x8' American High Duty Cone, Q.C.
18"x8' LeBlond Cone, B.G.
18"x8' Greaves Klusman Grd. H.d. T.A. Q.C.
20"x17' Greaves Klusman Grd. Hd. T.A. Q.C.
20"x8' American Grd. H.d. M.D.
25"x16' LeBlond H.D. 3 S.C.D. D.B.G.
36"x20' Fifield Engine Lathe, Cone Drive.

GRINDERS
#55 Heald Internal Grinder, Belt driven.
12" Pratt & Whitney Surface Grinder, B.D.
14"x72" Queen City Self Contained Plain.
60"x60"x12' Pond H.D. 4 hds.
#5 Oliver Drill Grinder, Motor Driven.

GEAR CUTTERS
#3-26" B & S Gear Cutter.
#1 and 3 Adams Gear Hobbers.

BORING MILLS
42" Niles Bement Pond, H.D.

BOLT & PIPE THREADERS
2" Landis with Lead Screw Cone drive.
3" Landis Cone drive.
1" Acme Cone drive.
2" Landis Pipe Machine Cone drive.
2" Acme Cone drive.

RADIAL & UPRIGHT DRILLS
4'x6' Bickford Plain S.P.D.
20" Barnes 4 spindle drill.
26" Barnes All geared Tapping attachment.

SHAPERS & PLANERS
24" Rockford H.D. Back Geared Crank.
24" Steptoe H.D. Back Geared Crank.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

EXCEPTIONAL TOOLS

LATHES
30"x20' LeBlond, q.c. mtrzd.
18"x16' Flather, belt drive, quick change.
40 Lathes in stock, 12" to 54" swing

GRINDERS
12"x36" Pratt & Whitney Surface belt drive.
12"x36" Modern Plain Cylindrical, self contained.
20"x144" Landis Plain Cylindrical.

POWER PRESSES
#4 Federal Inclinable, 3" stroke, bed 27"x14¾", cap. 35 ton.
25 ton Henry & Wright h.s. Dicing Machine, 5½" single roll feed.

MISCELLANEOUS
20 spindle Natco, mtr. dr. #2 M.T.
#2 Baker Keyseater, belt dr. cap. 2"x20".

THE O'BRIEN MACHINERY CO.
113 N. THIRD ST., PHILA., PA.

1—10 x 18 **Plain Norton Grinder,** M.D.
1—10 x 24 **Plain Norton Grinder,** M.D.
2—#6 **Bryant Chucking Machines**
1—#16A **Blanchard Surface Grinder**
1—15" **Gleason Pinion Roughers**
1—#17 **Barber Colman Gear Hobber**
1—#3C **Lees Bradner Thread Miller**
1—**Norton** Type B Model 81 **Crankpin Grinder**
1—910 **Barnes** Single Spindle **Reaming Machine**
1—**Bury** 2 Stage **Air Compressor**
1—#13 **Pratt & Whitney Multiple Drill,** M.D.

Your inquiries receive prompt attention

CENTRAL MACHINE TOOL CORPORATION
122-126 Nebraska Ave. Toledo, Ohio
Adams 1914

OTT MACHINERY SPECIALS

AUTOMATICS, Acme #56—2¼" 4 spdle.
AUTOMATICS, Cleveland 4½" Model M Chucker
AUTOMATICS, Cleveland, 3¼" Model A, M.D.
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
BORING MILLS, Bullard, 42" 2 Swivel Heads
BORING MILLS, Niles, 54" 2 Swivel Hds.
GRINDERS, B.&S. #2 & 3 Universal
GRINDERS, Landis, 10x36" Self Contained
GRINDERS, Landis, 16x72" Plain
GRINDERS, Norton, 10x24 & 36" Plain
LAPPER, Norton #15 Vertical, M.D.
MILLING MACHINES, Becker Vertical, #4B, Model B1—M.D. & C5.
PLANERS, 30x30x8' Cit-44x44x18' Niles
PRESSES, Toledo, #34 Solid Back. S. G.
PRESSES, Ferracute, P2, 3 & 4, Solid Back.

OTT MACHINERY SALES, INC.
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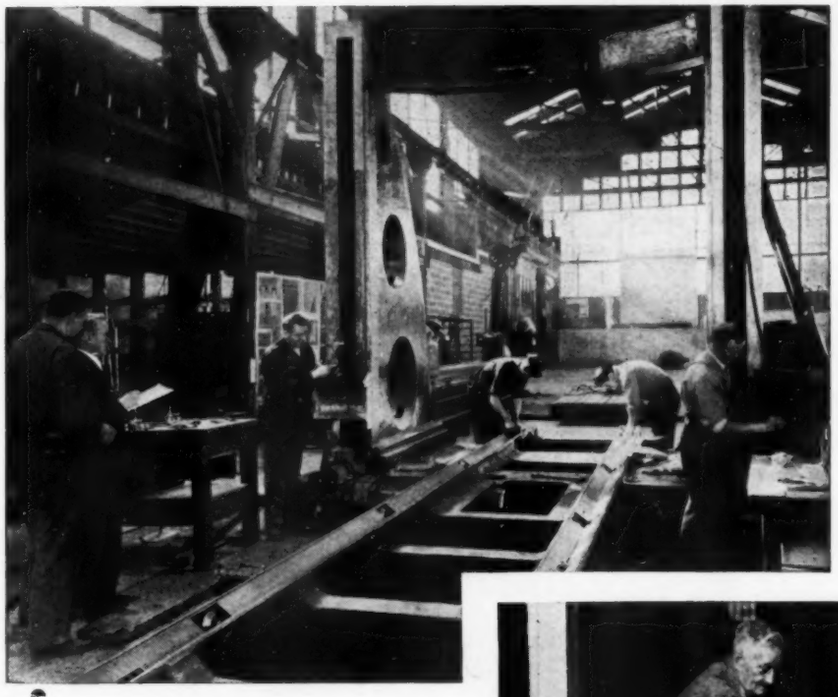
REBUILDING PLANERS *IS OUR SPECIALTY*



This photo shows the beginning of assembly of a 96" Niles Planer recently rebuilt in our Newark plant.

This type of work requires exceptionally diversified machine tool experience. Men with 25 to 35 years experience are the backbone of our organization. These men have been recalled to active duty and are now busily engaged returning machines to the industry that would otherwise be discarded as obsolete.

Don't Retire Your Old Machines

ATLANTIC CAN REBUILD THEM

IN STOCK ***Ready for Rebuilding and Modernizing to your Specifications***

PLANERS

30"x30"x12' Whitcomb—2-heads
36"x36"x12' Betts, 4-heads
36"x36"x16' Niles 4-heads
42"x42"x12' Cincinnati, 2-heads
42"x42"x12' Pond, 2-heads
42"x42"x16' NBP, 3-heads
48"x48"x16' Putnam, 4-heads
60"x60"x18' Niles, 4-heads
72"x72"x12' Putnam, 4-heads
78"x70"x27' Bement, 3-heads
72" Morton Portable

BORING MILLS—HORIZONTAL

4" Betts Knee Table Type
4¾" Niles Knee Table Type
4½" Ryerson Floor Type
8" & 5" Putnam Double Spindle, Cylinder Borer

BORING MILLS—VERTICAL

42" Colburn H.D. Motor Drive
42" Niles Standard, Motor Drive
48" Niles Wheel Borer, Motor Drive

NEW MACHINES

3½" and 4" Heavy Duty Horizontal Boring Machines, *table type.*

•

6"x18" Surface grinders *precision type.*

•

12" Slotters. Dual control, motor in base.

ATLANTIC MACHINERY CORPORATION

149 BROADWAY Telephone WOrth 2-0662 **NEW YORK**

EMCO REBUILT MACHINE TOOLS

AUTOMATICS
⅜-½" Cleveland Model B, m.d. (2)
4 spindle ⅞" Cleveland Model M, m.d. (2)
⅞" Model A Cleveland, belt
1¼-1; ½" Cleveland Model B, bel.
1¼" Hartford, belt
2½" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
No. 5A Potter & Johnston Automatics (7)
No. 6A Potter & Johnston (3)
No. 6D Potter & Johnston for brake drum work
No. 23, 24 New Britains, belt

ARBOR PRESSES
No. 24 Greenerd, m.d.
15 ton Lucas, belt
No. 3 Famco, bench type

BOLT THREADING MACHINES
9/16" Landis 2 spindle, m.d.
2 spindle 1" Acme, belt
3 spindle 1" Acme, belt
1" Landis belt
1½" Landis 2 spindle, m.d.
1½" Landis, belt, lead screw
2½" Acme, belt
American Bolt Heading Machine, belt, 1¼" cap.
No. 11S Rickert & Shafer Automatic Threading, 1" cap., m.d.

BORING MILLS
30" Colburn, 1 head, belt
48" Niles-Bement-Pond Car Wheel Borer, belt
51" Baush, m.d., 2 heads
7' Niles, 2 heads, friction feeds, old
No. 2 Barrett Cylinder Borer, 5" bar, belt
Niles-Bement-Pond Cylinder Borer, m.d., 12" main bar

BROACHING MACHINES
Cincinnati Mill Broach, m.d., brand new
No. 2 J. N. LaPointe, m.d., gear box
No. 2 LaPointe of Hudson, belt
No. 3B J. N. LaPointe, gear box, m.d.
No. 3 J. N. LaPointe Double, belt

CENTERING MACHINES
Hendey Single End, 14½" swing
Whiton Single End, 12" swing
Phoenix Single End

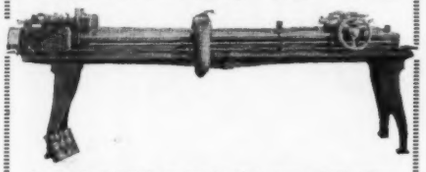
BALL BEARING DRILLS — SINGLE SPINDLE
Allen No. 2, belt
Henry & Wright Class B No. 2, belt
Henry & Wright Class K, No. 2, belt
Leland & Gifford No. 2, belt

BALL BEARING DRILLS, MULTIPLE SPINDLE
2 spindle Edlund No. 3, m.d.
2 spindle Henry & Wright No. 2, belt
2 spindle Leland & Gifford No. 2, belt
2 spindle Textile Horizontal, m.d.
3 spindle Avey, m.d.
3 spindle Cincinnati Pulley Machinery No. 2, belt
3 spindle Demco, power feed, No. 2
3 spindle Edlund No. 2, m.d.
3 spindle Henry & Wright class K No. 2
4 spindle Allen Class B No. 2
4 spindle No. 2 Fosdick, power feed
4 spindle Gardam No. 1
4 spindle Henry & Wright Class B No. 2
4 spindle Henry & Wright Class K No. 2
4 spindle Kokomo No. 2
4 spindle Leland & Gifford No. 2 m.d.

MULTIPLE SPINDLE DRILLS
3 spindle 20" Barnes Gang
4 spindle No. 2 Colburn Mfg.
4 spindle No. 3 Foote-Burte
4 spindle No. 2 Foote-Burte Rail
4 spindle No. 4 Foote-Burte Rail
5 spindle 24" Barnes All Geared Self-Oiling
6 spindle 21" Hoefer
6 spindle National Acme Auto Horizontal
6 spindle Niles
No. 00S, 18S Garvin Horizontal Duplex
No. 1 Pratt & Whitney 2 spindle Gun Barrel
D2 Fox Straight Line
No. 2, 3 Baush
No. 5 Fox
No. 30, 37 Natco
No. 7D Moline 2 spindle Hole Hog
No. 15HC Fox
No. 18 Natco
No. 25 Baush Straight Line
No. 26C Fox Tapper No. 51C Harrington
D31 Fox
Partial Listing only. Send us your inquiries.

The EASTERN MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

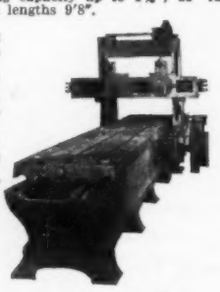
Immediate Delivery!
Gun Barrell Deep Hole Drills

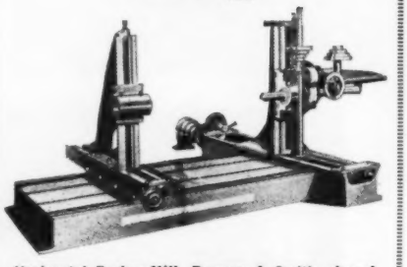


1—**Pratt & Whitney Horizontal, two spindle Gun Barrel Drills;** drilling capacity up to 1¼" diameter; 13" face, 7' swing, bed 9'8".

5—**Bausch Horizontal, two spindle, Gun Barrel Drills:** drilling capacity up to 1¼", 13" face, 7' swing, bed lengths 9'8".

GRAY PLANER: 36"x36" x 12'6" bed, 2 heads on rail, pulley drive. Also a 26" x 26" x 6' Hamilton, 1 head on crass rail, pulley drive.





Horizontal Boring Mill, Beaman & Smith, size of platen 3'x4" wide, 7' long, 5 MT Hole, complete with 2 HP AC Motor, floor type gear box machine, extra cutters and two boring bars.

Other machines in our large stock.

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602 West Lake St. Chicago, Ill.
TELEPHONE: HAYMARKET 4114

No. 3 Acme Universal Turret Lathe. Grd Head. Arranged for Chucking.
21" Model H Gisholt Turret Lathe.
14 ga x 8' OHL power Squaring Shear.
4 & 6 Spindle Avery Sensitive Drills No. 2 M.T., B.B.
No. 1B, No. 2B Edlund, 2 Spindle Sensitive Drills
16"x66" Landis Universal Grinder. Overhead belt drive
Landis Crankshaft Grinders 16"x48", and .16" x 60", self-contained countershaft, M.D.
20"x10' Monarch Lathe, Q.C.G. Cone
10' Robinson Toggle Type Press Brake
No. 12, 13 Natco Drills

IROQUOIS MACHINERY CO.
662 Ohio St. Buffalo, N. Y.

MISCELLANEOUS MACHINES
#3 **Barrett** 6" bar Cylinder **Boring Machine**
Rockford Dbl. End Hydraulic **Boring Machine**
24"x14' bed **Schumacher-Boye Lathe,** rebuilt
2" **Landis** Dbl. Spdl. **Bolt Cutter**
3" **Landis** Single Spdl. **Bolt Cutter**
36"x30x20' **Whitcomb Planer,** 2 heads
30x30x8' **Gray Planer,** 2 hds.
#40 **NATCO** Straight Line **Multiple Drill**
#60 **NATCO** 3-way **Multiple Drill**
#304A **Oster** 4" cap. **Pipe Machine**
Rockford Sgl. End. **Hydraulic Boring Unit,** with 2-sta. 54" dia. table
C-13H **NATCO Hydraulic,** m.d.
No. 14 **NATCO Multiple** with 12 spdls.

THE STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio **2832 E. Grand Blvd., Detroit, Mich.**

For Immediate Delivery:

#1½ Cincinnati Universal Milling Machine.
#3 Cincinnati Plain Milling Machine.
#4 Cincinnati Universal Milling Machine.
#4 Becker Vertical Milling Machine.
#2 Warner & Swasey Turret Lathe.
#6 Warner & Swasey Turret Lathe.
#4 Turret Lathe.
Brown & Sharpe #6—60" Gear Cutter.
Betts Vertical Slotter 24" stroke.
¾" Gridley 4 spindle Automatic.
18"x8' Monarch, Q.C., back geared lathe.
16"x6' Hendey, Q.C., yoke head.
14"x6' Hendey, Q.C., G.H., T.A.
16"x10' Whitcomb Blaisdell, Q.C.
12"x6' W. C. Young, B.G., Q.C., engine lathe.
9"x4' Seneca Falls, B.G., bench lathe.
15"x6' Greaves Klausman, B.G., Q.C., lathe.
14"x6' Flather, B.G., Q.C., lathe.
Williams' Universal Nipple Machine 1' to 4".
4' Universal Radial Drill.
Bliss #0, stiles, C.B., power press.
Bliss #4, stiles, C.B., power press.
24"x14' New Haven Planer.
24", 20" and 16" G. & E. Shapers, back geared.
20" Steptoe Shaper.
#3 Modern Universal Cy. Grinders (8).
Several large planers.
#2 Bath Universal Grinder.

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New York City
Whitehall 3-7518 Worth 4-5864

No. 73½ Bliss S.S. Geared Press
No. 7 Oxygraph Gas Cutting Machine
No. 3 Crescent Saw Table
4-Spindle Demco Drill, 12" overhang
18" x 8' Illinois Lathe

D. E. DONY MACHINERY CO.
New and Used Machine Tools
47 Laurelton Road Rochester, N. Y.

NO. 12 PRATT & WHITNEY 2 SPINDLE PROFILER
ROSENKRANZ MACHINERY CO.
30 Church Street, New York City

GEAR CUTTERS, Spur, 30", 40" & 84", M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
GRINDER, Gear Tooth D-12 Detroit, M.D.
GRINDER, Warm Hob 10" x 12", B.D.
GRINDER, Universal, No. 5 B & S, 20"x72", B.D.
LATHES, Geared Head, 15"x8', 20"x10', 24"x12'
MILLER, Plain No. 14 Garvin, B.D.

LANG MACHINERY COMPANY
28th Street & A.V.R.R. Pittsburgh, Pa.

AUTOMATICS
Cleveland, Model A, ½", ⅝" ⅞", 1¼", 2", 2¼".

AARON MACHINERY CO.
176 Lafayette St. New York, N. Y.

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
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Tioga, Livingston and Almond Streets
Philadelphia, Pa.

#12 GREENFIELD

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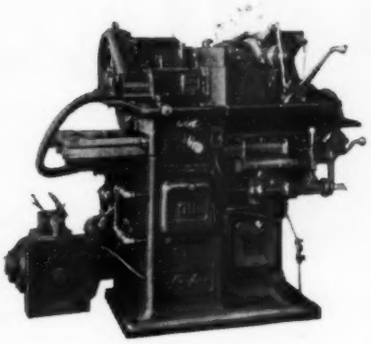

#70 HEALD INTERNAL GRINDER

LATHES

42"x25' POND Heavy Triple Grd, belt dr.
27"x20' LODGE & SHIPLEY, Patent Head
26"x15' GREAVES KLUSMAN, Pl. Change with Raising Blocks to swing 48"
26"x12' CRAWFORD ERIE Heavy Duty Lathe, quick change gear.
25"x12' LEBLOND Heavy Duty, Taper Attach.
20"x8' AMERICAN, QCG, Motor Drive
20x10 DAVIS, QCG, cone drive
21"x8' LEBLOND, turret on carriage
18"x12' PRENTICE, cone
18"x12' HAMILTON, cone
18"x8' LEBLOND Production, QCG
18"x8' MUELLER, QCG, cone
18"x8' CHARD cone
18"x8' CISCO, QCG, cone
17x8' SIDNEY
16x8' CINCINNATI, QCG, cone
16x8' CINCINNATI, QCG, taper
16x6' LODGE & SHIPLEY Geared Head
16x6' AMERICAN Geared Head
16x6' PRATT & WHITNEY cone
16x6' MONARCH, QCG, cone
16x6' LODGE & SHIPLEY, QCG, cone
14x6' ROCKFORD, QCG, cone
14x6' STANDARD LATHE WORKS, Pl. cone
14x6' MONARCH, QCG, cone
13x6' PRATT & WHITNEY Model "B" gagemaker
13x5' MULLINER, QCG, cone
13x5' MULLINER, QCG, taper, dr. bar
4"x104" L-swing, 4"x60", 4"x48"
10"x42" LOGAN (new)

HORIZ. BORING MILLS

#0 GIDDINGS & LEWIS 3" bar
#32 GIDDINGS & LEWIS 3⅛" bar (2)

RADIAL DRILLS

5' FOSDICK, Univ.
4' N.B.P. Semi-Universal, 11" col.
3' BICKFORD, 9" column
3' CARLTON, Sensitive, B.B.; M. D.
3' AMERICAN, Sensitive

DIE CASTING MACHINES

3—MADISON-KIPP 500# pressure; Gooseneck #5; sizes: 10x12; 12x14; 12x16. Late models—Bargains

FORGING PRESS

#4 BLISS, with taper rolls
#75½ BLISS Geared

VERTICAL BORING MILLS

42" COLBURN Power Rapid Traverse

LARGE PLAIN MILLER

#4 LeBlond—Heavy. Motorized Gear Box Dr. Perfect Condition.

#1½ B&S PLAIN
#1½ CINCINNATI Plain
#½ VAN NORMAN
#0 VAN NORMAN (2)
#12 B&S, Production Mill
#4 HENDEY Plain
#1A GOOLEY & EDLUND

PLANERS

42"x36"x12' CINCINNATI
20"x20"x24' N.B.P. Planer-Shaper

SHAPERS

14" GOULD & EBERHARDT
15" POTTER & JOHNSTON
16" SMITH & MILLS
16" STOCKBRIDGE
17" SMITH & MILLS
20" OHIO
20" AMERICAN
20" CINCINNATI
24" GOULD & EBERHARDT, cone
24" GOULD & EBERHARDT, Gear Box
28" GOULD & EBERHARDT "Invincible"
24" Stockbridge
25" CINCINNATI

MISCELLANEOUS

#4 W-W Bulldozer
Riveting High Speed Hammers in all sizes.
Paper Cutter 42" ACME
Motors and Generators

MACHINISTS BENCH VISES

All Sizes—Plain and Swivel

THREAD MILLER

6x14 PRATT & WHITNEY

PRESSES

#18" BLISS, OBI
#19 BLISS, OBI, 3
#19C BLISS, OBI
#20 BLISS, OBI
#22B BLISS OBI
#21 BLISS, OBI
#21½ BLISS Grd, OBI
#75 TOLEDO Plain
#75 TOLEDO Geared
#3 CONSOLIDATED
#14 STOLL
#3 AMERICAN CAN CO. OBI
#3 ADRIANCE
#37½ BLISS S.S. Plain
#5 AMERICAN, S.S. Tie Rd
#3R MARQUETTE Grd; M.D.
#702 BLISS Flat Trimming
#4 BLISS, Back Flywheel
#50 PERKINS Dble Crank Pl.
#4 BAXENDALE (3) OBI
#6 WATERBURY O.B.I.
#25 STOLL Horn Press
#301S BLISS Auto. Gang Press
25-ton HENRY & WRIGHT
#93D TOLEDO S.S. Solid Frame, Dble crank; 4" stroke, grd
#166 CONSOLIDATED Dbl Cr., Geared, Air Cushions
2A W & S
2¼ x 24 J & L
3 x 36 J & L
24" GISHOLT

GRINDER

#3V GALLMEYER & LIVINGSTON "New" HYDRAULIC SURFACE GRINDER Motor Drive.

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Machinery Merchants
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No. 0 Brown & Sharpe
1¼" Model F Gridley, four spindle
¾" Model F Gridley, four spindle
2¼" Model F Gridley, four spindle

BROACHES
No. 3 LaPointe

DRILLS
3' Cincinnati Bickford radial
No. 2 Colburn, single spindle
24" Barnes, power feed
No. 12 Natco Multiple Spindle
No. 13 Natco Multiple Spindle
Three Way Natco Horizontal Multiple Spindle

GEAR CUTTERS
15" Gleason Spiral Bevel
18" Gleason Gear Tester

GRINDERS
No. 2 Cincinnati Centerless
No. 10 Lees-Bradner, gear
No. 70 Heald Internal
No. 55 Heald Internal
No. 60 Heald Internal
22"x84" Pratt & Whitney Surface
No. 2 Brown & Sharpe Universal
10"x20" Landis Cylindrical
16x50 Norton Crankshaft
18"x96" Brown & Sharpe Cylindrical
No. 20 Bryant Chucking
20A Bellvue Drill
Ingersoll Cutter, Tub Type

LATHES
14"x6' Monarch, c.d.
16"x6' Lodge & Shipley, c.d.
16"x8' American, g.h.
18"x8' Monarch, c.d.
21"x8' LeBlond, c.d.
18/36"x12' Rahn Larmon Extension Bed Gap
3½x60" Fitchburg Lo-Swing, g.h.
8"x60" Fitchburg Lo-Swing, g.h.
11"x5' LeBlond Production, g.h.
14"x6' LeBlond Production, c.d.
18"x7' Chard Production, c.d.

TURRET LATHES
No. 1B Foster
Model C 26" Libby, 7½" hole
No. 2A Warner & Swasey
No. 3A Warner & Swasey
No. 1 Warner & Swasey
No. 4 Warner & Swasey
No. 6 Warner & Swasey
No. 7 Bardons & Oliver
No. 9 Bardons & Oliver
2¼x24 Jones & Lamson
No. 6A Potter & Johnson Automatic

MILLS, BORING
52" Gisholt vertical, m.d.

MILLS, PLAIN
No. 3B Kearney & Trecker, s.p.d.
No. 3 Cincinnati, c.d.
No. 14A Garvin, c.d.
No. 1 Bristol Hand
U. S. Hand

MILLS, UNIVERSAL
No. 2 Cincinnati, s.p.d.
No. 2A Garvin, c.d.

MILLS, VERTICAL
No. AB Becker, c.d.
No. 4B Becker, c.d.

OIL GROOVER
Wicaco Continuous

SAWS
No. 4 Atkins Band, m.d.
No. 12 Higley Cold Cut
No. 6 Nutter & Barnes

SHAPERS
16" Hamilton, c.d.
20" Cincinnati, c.d.
24" Cincinnati, c.d.
24" Cincinnati, s.p.d.
28" American, s.p.d.

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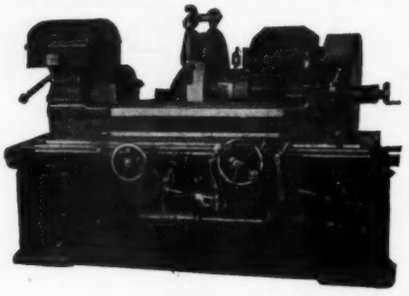
INDIANAPOLIS, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

HILL-CLARKE MOTOR DRIVEN GRINDERS



SIZES

6 x 32	10 x 72	16 x 36
10 x 18	14 x 36	16" x 50"
10 x 24	14 x 50	16 x 72
10 x 36	14 x 72	18 x 96
10 x 50		

HILL-CLARKE MACHINERY CO.
651 WASHINGTON BLVD. CHICAGO

RECONDITIONED MACHINE TOOLS

1—28" x 21' Chard Quick change lathe, taper attachment
1—36" x 26' New Haven Heavy Duty lathe
1—42" x 17'5" Bement Miles Lathe-geared face plate
1—44" x 16' Lodge & Shipley Quick change geared lathe
1—26" x 16'6" Bullard Heavy Duty lathe, geared chuck taper attachment
1—6' Radial Drill arranged for Motor drive
1—4' Un. Radial Drill
1—6" Bar Pedrick Horizontal Floor type Boring Mill, M.D.
1—24" x 10' American Q.C. Geared Head, single pulley drive Lathe
1—18" x 6' Prentice Q.C. Geared Head, S.P.D. Lathe, Pan bed.
1—25" Milwaukee H.D. Back geared Shaper, V ram type for M.D.
1—24" Gould & Eberhardt Heavy Duty B.G. Shaper with V ram type
#3 Cincinnati Universal Double back geared positive feeds milling machine, Motor driven
#55 Hendley and Whittemore Punch and Shear arranged for M.D.

GLOBE MACHINERY CO.
214 Center St. New York

7"x32" Pratt & Whitney Precision Lathe
16"x12' Rahn & Larmon Lathe, Grd. Hd., T.A.
18"x12' Hendey Grd. Hd., T.A.
26"x18' Pittsburgh Lathe, B.D., T.A.
3-D Gisholt Simplimatic, M.D.
26" Libby Turret Lathe, 7¾" Hole.
5' American Radial, Semi-Universal, B.D.
#2 Walker Tool & Cutter Grinder, B.D.
39"x36"x12' Cin. Planer, 2 Heads
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
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30" X 20' LATHE

30" x 20' LeBlond Engine Lathe, motorized with motor, quick change feeds, excellent condition

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PLANER—36" x 36" x 8' **POWELL**, HD 1 rail head, power rail adjustment, direct-connected DC Reversing Motor Drive, with motor.
SLOTTER, CRANK—24" **BETTS** Heavy Duty.
ALSO MANY OTHER TOOLS

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UNIVERSAL MILLING MACHINE

1—No. 42 Oesterlein, complete Universal equipment, table 71" x 13½".

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1—14' Sellers Vert. Boring Mill.
1—12" x 96" Landis Grander. Self-Cont.
1—#3 Cinn. High-Pwr. Vert. Miller
1—14" Pratt & Whitney Surf. Grinder
1—4" Bar Landis Floor Borer, M.D.
2—#2 Cinn. Centerless Grinders.
1—48" x 1" Cap. Bertsch Shear
1—42" Colburn Vert. Boring Mill
1—36" x 20' Le Blond Lathe, Q.C.G.
T. R. WIGGLESWORTH & CO., MACHINERY
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72x72x17' Dietrich and Harvey open side Planer, M.D.
96"x20' Putnam geared face plate driven Lathe
42" Bullard vertical Boring Mill M.D.
16x10' Hendey, M.D., Lathe
16x54 Norton Grinder
16x66 Landis Universal Grinder
5' Fosdick Radial Drill

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MILLING MACHINE

One Hall Planetary Milling Machine, Model "D", for milling threads on shells.

S. B. MARTIN CO.
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Hendey 12" swing quick change geared motor driven tool room lathe.

No. 2 Cockane & Bly die filing machine motor driven, Universal table.

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No. 1 LaPointe, screw type.
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No. 3 Oilgear hydraulic, m.d.
No. 3 LaPointe of Hudson, screw type.
No. 3 J. N. LaPointe double screw type.
No. 3 Amer. hi. sp. rack type.
No. 4 LaPointe of Hudson, screw type.
2 ton American vertical.

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No. 18H Gould & Eberhardt universal gear hobber.
12" x 13" No. 12HS Gould & Eberhardt Mfg. hobber.
12 x 10" No. 12 Barber Colman hobbers.
24" No. 3 Adams Farwell gear hobber.
8" x 10" No. 1 Lees Bradner production hobber.
14" x 8" No. 5A Lees Bradner universal hobbers.
26" x 8" No. 3 B&S auto spur.
36" x 6" G&E spur gr. cutter.
48" x 10" No. 4 Brown & Sharpe automatic spur.
Gleason bevel gear tester.
National Tool Co. (Cleveland) Model B gear and gear shaper cutter checker.
15" Gleason bevel gear quencher.
Lipe gear tooth chamfering machine, double spindle.

GRINDERS, CYLINDRICAL, PLAIN AND UNIVERSAL
6" x 32" Norton.
10" x 20" Bath No. 1 univ.
10" x 24" Landis.
10" x 36" Bath No. 2½ univ.
10" x 36" Norton.
10" x 50" Norton.
10" x 52" Landis.
12" x 36" Landis self cont.
12" x 72" Landis.
16" x 42" Landis universal.

GRINDERS, TOOL AND CUTTER
No. 3 Barber Colman hob grinder.
6¼" x 18" Schuchardt & Schutte hob grinder.
10" x 20" No. 1 Bath univ.
10" x 36" No. 2½ Bath univ.
Gisholt tool grinder.
24" Ingersoll tub type face milling cutter grinder.
Sellers lathe and planer tool grinder.
2¼" Wilmarth & Morman drill grinder, belt drive.
2¾ No. 5 Oliver drill grinder.
Oliver drill point thinner.

GRINDERS, MISCELLANEOUS
14" P&W vert. B.B.
No. 2 Heim centerless.
5" x 7" Pratt & Whitney worm or thread grinder, cam feed type.
Pratt & Whitney worm grinder, screw feed or leader.
Hutto honing machine, type MD 583.
No. 75 Heald internal.
No. 6 Bryant internal.
No. 50 Heald hydraulic cyl.
No. 60 Heald cylinder.
Type 15 Norton vertical lapping machines.
No. 575 Hawes continuous rod and tube polisher.
10" x 27" No. 20 Bath spline
10" x 50" Norton cam shaft
17" x 36"-48" Norton, Type B, Model 84 hydraulic crank-pin grinder.
30" x 4" No. 41 Ransom dbl. end, mtr. on spindle.
30" x 84" Diamond face and edge, motor drive.

KEYSEATERS
2" No. 3 Mitts & Merrill.
2½" No. 4 Mitts & Merrill.

MILLERS, PRODUCTION AND MISCELLANEOUS
48" Newton, 2 spindle continuous rotary.
48" Ohio (Oesterlein) tilted offset.
60" Ing., 3 spdl., cont. rot.
Model C Becker, continuous rotary, 29¼" diameter table.
Sundstrand Rigidmil.
No. 33 Kempsmith Mfg.
No. 45 Bilton Productomatic.
12" Cincinnati plain and BG Mfg. millers.
Nos. 1 & 1A Davis & Thompson drum type cont. dup.
Nos. 3, 3B, & 6 Lees Bradner thread miller, collet
No. 1 Kent Owens (Toledo) hand, roller bearing.
Superior, hand.
Pratt & Whitney, hand.
No. 3½ Fox, hand.

PLANERS
24" x 24" x 24" Cincinnati, crank type, 1 rail head.
24" x 24" x 5' Gray, 1 rl. hd.
24" x 24" x 6' Gray, 1 rl. hd.
24" x 24" x 6' Woodward & Powell, 1 rail head.
26" x 26" x 8' Amer., 1 rl. hd.
30" x 30" x 10' Cincinnati, one (or two) rail heads.
32" x 32" x 12' Niles, 1 rail and 1 side head.
36" x 36" x 10' Woodward & Powell.
56" x 56" x 16' Gray, 2 rail and 2 side heads.
36" x 36" x 16' Cleveland openside, 1 rl. & 1 side hd.
56" x 56" x 16' Gray, 2 rail and 2 side heads.

PRESSES
No. 7 Toledo, O.B.I.
No. 21½ Bliss Obi, geared.
No. 4 Waterbury Farrel Obi.
No. 62 Bliss 6" stroke openback non-inclinable.
No. 76 Toledo, 3" stroke, openback, non-inclinable.
40 ton No. 6, series A Waterbury Farrel 1½" stroke openback non-inclinable.
28", No. 71 Swaine double crank 1" stroke.
44" Leffler double crank.
No. 4 Massillon s.s. geared.
No. 53 Toledo s.s.
No. 65 Bliss 3" stroke consolidated S.S. geared.
No. 7 Rockford S.S. geared.
No. 8-7 Zeh & Hahnemann s.s. geared. 2⅜" stroke.
No. 55½ Toledo s.s. flywheel.
No. 57S Toledo s.s. tiered frame. 21,320 lbs.
No. 30E Cleveland s.s. double geared. 235,000 lbs.
750 ton Baldwin Southwark triple action hyd. tog. draw press. Wght. 500,000 lbs.
No. 796¼D TOLEDO 108" double crank, toggle.
No. 180 Toledo, dbl. grd. tog.
No. CA14 Ferracute horning.
No. P2 Ferracute, punching.
No. 2 Standard Machinery Co., screw press.

PUNCHES
6" throat ⅝"x6" Hendley & Whittemore, No. 54, punch, rod cutter and shear, with angle shear attach.
12" throat, 1¼"x1 Long & Allstatter No. 1½, architectural jaw.
12" throat, 1¼"x1" Cleveland horizontal, arch. jaw.
25" throat, ¾"x¾" Cleveland, architectural jaw.
26" throat ¾"x¾" Rock River, architectural jaw.
Universal Ironworker.

RIVETERS
⅛"No. 1½B High Speed hammer type.
3/16" No. 103A Grant spinner.
5/16"No. 3A High Speed hammer type.
⅜" No. 4A High Speed hammer type.
¾" to 1⅛" No. 7B High Speed hammer type.
⅝" 20 ton Allen pneumatic, 6" reach, 8⅝" gap.
¾", 30 ton Hanna pneu. pinch bug, 8" reach, 13½" gap.

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Please mail us your list of surplus machinery

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SAGINAW, MICHIGAN

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16x10 Lodge & Shipley Q.C. D.B.G.
18x12' Schumacher Boye Emmes Q.C. D.B.Grd.
24x12' New Haven Q.C. D.B. Grd.
18x12' Whitcomb Blaisdell Q.C. D.B. Grd.
18x12' Reed L.C. Cone Dr.
20x10' LeBlond L.C. Cone Dr.
#7 B. & D. Turrett Power feed

SHAPERS & PLANERS
24" Cinti Crank C Drive
24" Smith & Mills Cone Dr.
16" Kelley C. D.
16" Cinnti Cone Dr.
30x30x10 American Planer
36x36 x 16' Putnam 2 Hds.
36x36x12' American 1 Head

MISCELLANEOUS
No. 3 Brown & Sharpe Plain Cone Dr.
B.&S. Univ. Miller Old Style
1¼" Dresses Hand Screw Mach.
#2 M. & M. Keyseater
3" Mueller Radial S.P.D.
2" American Radial S.P.D.
No. 1 L&A Dble End Punch & Shear
18" Gleason Bevel Gear Generator

JONES MACHINE TOOL COMPANY, 528 E. Front St., Cincinnati, Ohio

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1—Gould & Eberhardt 72" Spur and Worm Gear Cutter.
1—7' Dreses Radial Drill heavy duty.
1—24" Gould & Eberhardt Crank Shaper.

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218 High Street **Boston, Mass.**

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Shapers: 24" G&E.
28"x20'6" **Rahn-Carpenter Lathe** 14' between centers
24"x16' **Greaves & Klusman**
Briggs Type A Milling Machine, Long Table
#12 **Brown & Sharpe Production Milling Machine**
Presses: #43 Niagara, #16 J. M. Robinson ⅜" capacity Rock River punch and shear
Spencer Turbine Compressor.
Drill Presses: 28", 24" Hoefer; 25", 20", 40" Bement
2 50# **Bradley upright hammers,** m.d. like new
Radial Drills: 5' Bausch
Miller: 20"x24"x18" Ingersoll
Grinders: #20 Bryant Internal
300 other machinery items
MOTORS—new 5 H.P. for 3-phase, ball brg. $55.75

Other sizes equally low priced. Also rebuilt motors.

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COLUMBUS, OHIO

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#3½ Waterbury Farrel DSSD Header
#5 Waterbury Farrel DSSD Geared Header
8—#3 Manville Automatic Bolt Head Trimmers
4—#4 Manville Automatic Bolt Head Trimmers
4—#375C Manville Automatic Bolt Head Trimmers
#500C Manville Automatic Bolt Head Trimmer

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3-Ton **PAWLING & HARINSCHFEGER** 18'10½" Span, 5' Spread, 15'2½" Lift, 79' Runway, 30# rail.

Motors—Hoist 7½ HP Bridge 5 HP, Trolley 1 HP AC 220 volt, 60 cycle, 3 phase. Weight approx. 11,000#.

CASH PRICE $1650.00, f.o.b. Michigan.

2-Ton **NORTHERN ENGINEERING** Electric Suspension Type Hoist, hand operated. $350.00.

J. LEE HACKETT COMPANY
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1000 lb. Swindell-Dressler Electric Arc Furnace, including electrodes, hydraulic tilting cylinder, hydraulic pump with motor, bus bars and three (3) 200 KVA Pittsburgh Transformers 22,000 primary voltage, 90 volts secondary. Purchased new 1938 and has seen a limited amount of service. Immediate shipment—Attractively priced.

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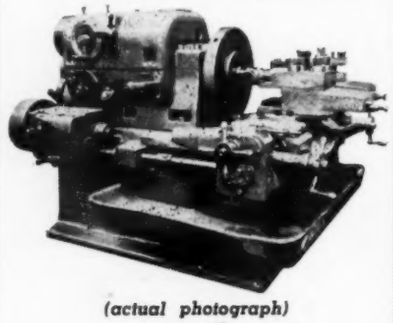
SEARCHLIGHT SECTION

BEVEL GEAR LATHE

One of our many items



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30" BRIDGEFORD BEVEL GEAR LATHE

All geared head
Largest diameter to swing over ways 26½"
Largest diameter to swing over carriage 15"
Diameter of face plate 20"
2 heads on carriage
Head travel on carriage 1½" L to R
Carriage travel on ways 8" F to B
12 spindle speeds 4.6 to 170 RPM
32 feeds .008 to .120 inches per rev.
Quick change gears
Arranged for belted motor drive.

This machine was designed for turning bevel gear blanks on a high production basis and can be adapted for any work requiring a facing operation.

Available for immediate delivery and may be inspected at our Chicago warehouse.

Louis E. Emerman & Co.

1761 Elston Ave. Chicago, Ill.

FOR SALE

HEAT TREATING GAS FURNACE WITH ELECTROTHERMIC CONTROLS

C. A. Hones Make

Tank: ⅜" Steel Inside Dimensions: 19' long x 54" wide x 15½" deep. Welded Inside and Out. Capacity: 11,000 lbs. Na No3 (approx). Operating Temperature:—900—1000 Degrees F.
Tank Supports: K30-3 1 FB.
Insulation: 2½" ram on base, 2½" Ins. Firebrick on sides.
Jackets 3/16" plate all around.

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Cairns Corporation

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Air Compressor

Ingersoll-Rand Horizontal Air Compressor, serial No. 60529, class ER1 with 9" x 8" cylinder. Good condition. Now in operation.

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JANUARY 8th ISSUE OF

AMERICAN MACHINIST

Close for press earlier than the usual closing time

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Monday, December 29th

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WANTED FOR IMMEDIATE PURCHASE

Straight Side Bliss #87 and 307 Single Crank Presses, Double Geared, 7" Crankshaft with 28" to 30" space between uprights. 10" to 30" strokes.

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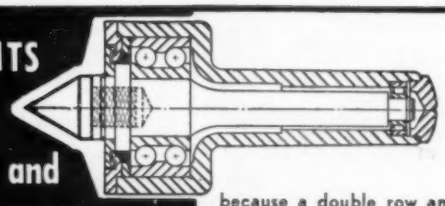

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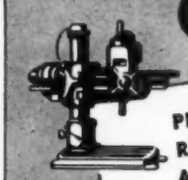

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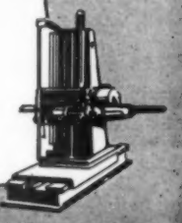

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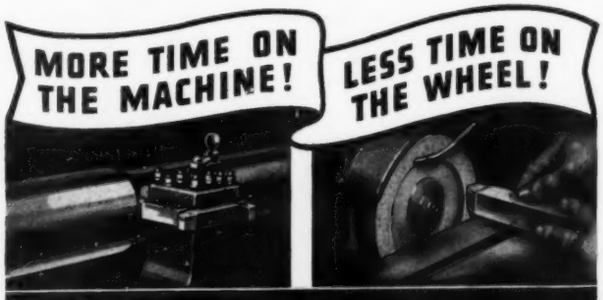

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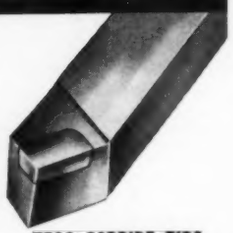

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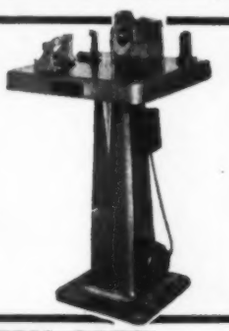
Grinds any profile desired with SPEED and ACCURACY



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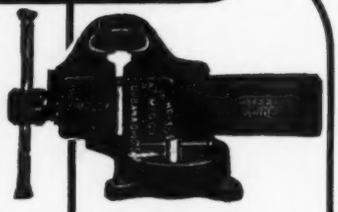

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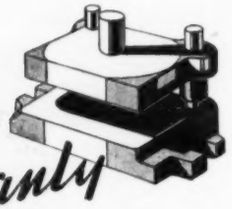

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CUTTING TOOLS, Tungsten Carbide
Excello Corp., Detroit

DEALERS, Machinery (See Searchlight Section)
Aaron Machry. Co., New York, N. Y.
Atlantic Machinery Corp., New York
Bennett-Rafken Machine Tool Co. Inc., N. Y. C.
Central Machine Tool Corp., Toledo, Ohio
Cincinnati Machy. & Supply Co., Cincinnati, Ohio
Dony Machry. Co., D. E., Rochester, N. Y.
Dulien Steel Prod. Inc., Fresno, Calif.
Eastern Machy. Co., Cincinnati, Ohio
Emerman & Co., Louis E., Chicago
Falk Machinery Co., Rochester, N. Y.
Galbreath Machinery Co., Pittsburgh, Pa.
Globe Machinery Co., Chicago.
Globe Machinery Co., N. Y. C.
Haskett Co., J. Lee, Detroit.
Hill-Clarke Mach. Co., Chicago, Ill.
Hyman & Sons, Jos., Phila., Pa.
Indianapolis Machinery & Supply Co., Indianapolis, Ind.
Iroquois Machy. Co., Buffalo, N. Y.
Jones Machine Tool Co., Cincinnati
Lang Machinery Co., Pittsburgh, Pa.
Lucas & Son Inc., J. L., Bridgeport, Conn.
Miles Machy. Co., Saginaw, W. S. Mich.
Morey & Co., Inc., New York, N. Y.
New York Machinery Co., N. Y. C.
O'Brien Machy. Co., Phila., Pa.
Osborne & Sexton Machy. Co., Columbus, O.
Ott Machy. Sales Co., Detroit, Mich.
Reconstruction Machine Tool Corp., N. Y. C.
Rosencrans Machinery Co., N. Y. C.
Simmons Mach. Tool Corp., Albany, N. Y.
Sun Machry. Co., Newark, N. J.
West Penn Machinery Co., Pittsburgh, Pa.
Wigglesworth & Co., T. R., Cleveland, O.
Zeeve & Co., Alex., New York, N. Y.

DEMAGNETIZERS
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Crafts Co., Inc., Arthur A., Boston
Diamond Tool Co., (Not Inc.) Chicago
Koebel Diamond Tool Co., Detroit

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE MAKERS BLUE
Dayton Rogers Mfg. Co., Minneapolis

DIE MAKERS SUPPLIES
Baumbach Mfg. Co., E. A., Chicago
Danly Mch. Specialties Co., Inc., Chicago, Ill.

DIE-MAKING MACHINES
Huskins Co., R. G., Chicago, Ill.
Oliver Instrument Co., Adrian, Mich.

DIE SINKING MACHINES
Cincinnati Milling Mach. Co., Cincinnati, Ohio

DIES, Adjustable and Self Opening
Eastern Mach. Screw Corp., New Haven, Conn.
Errington Mech. Lab., Staten Island, N. Y.
Geometric Tool Co., New Haven, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Murchey Machine & Tool Co., Detroit, Mich.

DIES & TOOLS
Hamilton Tool Co., Hamilton, Ohio.

DIES, Round Adjustable
Butterfield Division Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.

DIES, Self Opening
National Acme Co., Cleveland, Ohio

DIES, Steel Marking
Noble & Westbrook Mfg. Co., Hartford, Conn.

DIESEL FUEL INJECTION PUMPS
Excello Corp., Detroit

DISTRIBUTION PANELS
Square D Co., Milwaukee.

DIVIDERS
Brown & Sharpe Mfg. Co., Providence, R. I.

DIVIDING HEADS
Hartford Special Machinery Co., Hartford, Conn.
Scherr Co., George, New York, N. Y.

DOGS, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago
Ready Tool Co., Bridgeport, Conn.
Williams & Co., J. H., Buffalo, N. Y.

DRESSERS, Grinding Wheel
Desmond-Stephan Mfg. Co., Urbana, Ohio
Norton Co., Worcester, Mass.
Victor Machinery Exchange, N. Y. C.

DRILLING & TAPPING HEADS, Multiple
Baker Brothers, Inc., Toledo, Ohio

DRILLING and TAPPING MACHINES, Multiple
Bullard Co., Bridgeport, Conn.
Errington Mech. Lab., Staten Island, N. Y.

DRILLING & TAPPING UNITS
Baker Brothers, Inc., Toledo, Ohio

DRILLING MACHINES, Automatic and Semi-Automatic
Baker Brothers, Inc., Toledo, Ohio
Barnes Drill Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.
Sundstrand Machine Tool Co., Rockford, Ill.

DRILLING MACHINES, Bench
Barnes W. F. & John Co., Rockford, Ill.
Production Machine Co., Greenfield, Mass.

DRILLING MACHINES, Gang
Baker Brothers, Inc., Toledo, Ohio
Barnes Drill Co., Rockford, Ill.
Barnes W. F. & John Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio

WHERE-TO-BUY DIRECTORY

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Baker Bros., Inc., Toledo, Ohio
Barnes Drill Co., Rockford, Ill.
Barnes W. F. & John Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Consolidated Mach. Tool Corp., Rochester, N. Y.

DRILLING MACHINES, Horizontal
Baker Brothers, Inc., Toledo, Ohio
Kingsbury Mach. Tool Corp., Keene, N. H.

DRILLING MACHINES, Radial
American Tool Wks. Co., Cincinnati
Carlton Mach. Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cincinnati Gilbert Machine Tool Co., Cincinnati
Cleveland Punch & Shear Works, Cleveland
Fosdick Machine Tool Co., Cincinnati, Ohio

DRILLING MACHINES, Sensitive
Barnes W. F. & John Co., Rockford, Ill.
Fosdick Machine Tool Co., Cincinnati, Ohio
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Machine Co., Greenfield, Mass.

DRILLING MACHINES, Turret
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES, Upright Multiple Spindle
Baker Brothers, Inc., Toledo, Ohio
Barnes Drill Co., Rockford, Ill.
Barnes W. F. & John Co., Rockford, Ill.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fosdick Machine Tool Co., Cincinnati, Ohio
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLING MACHINES, Vertical
Baker Brothers, Inc., Toledo, Ohio
Barnes W. F. & John Co., Rockford, Ill.
Leland-Gifford Co., Worcester, Mass.

DRILLS
Cleveland Twist Drill Co., Cleveland

DRILLS, Brick, Stone, Cement, etc.
Armstrong Bros. Tool Co., Chicago

DRILLS, Center
Cleveland Twist Drill Co., The, Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRILLS, Core
Excello Corp., Detroit

DRILLS, Ratchet
Armstrong Bros. Tool Co., Chicago
Cleveland Twist Drill Co., Cleveland
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist and Flat
Cleveland Twist Drill Co., Cleveland
National Twist Drill & Tool Co., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

ELECTRICAL INSTRUMENTS
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ELEVATING TABLES, Portable
Hamilton Tool Co., Hamilton, Ohio.

END MILLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

EYE BOLTS
Williams & Co., J. H., Buffalo, N. Y.

FACE PLATES
Brown & Sharpe Mfg. Co., Providence, R. I.

FACING MACHINES, Precision
Excello Corp., Detroit

FANS, Electric
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FENCE, Chain Link
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.

FILE BANDS
DoAll Co., Des Plaines, Ill.

FILING MACHINES
Oliver Instrument Co., Adrian, Mich.

FIXTURES, Indexing
Zagar Tool, Inc., Euclid, Ohio

FLEXIBLE SHAFT EQUIPMENT
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

FORGINGS
Williams & Co., J. H., Buffalo, N. Y.

FORGINGS, Aluminum
Williams & Co., J. H., Buffalo, N. Y.

FORGINGS, Brass
Williams & Co., J. H., Buffalo, N. Y.

FRICTION PULLEYS
Brown & Sharpe Mfg. Co., Providence, R. I.

FURNACES, Carburizing
Surface Combustion Corp., Toledo, Ohio

FURNACES, Direct Heat, Electric
General Electric Co., Schenectady, N. Y.

FURNACES, Electric
Electric Furnace Co., Salem, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, Forging
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, Gas
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A., Baldwin, N. Y.

FURNACES, Heat-Treating, Tempering and Annealing
Hones, Inc., Chas. A., Baldwin, N. Y.
Surface Combustion Corp., Toledo, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES, High Speed Muffled
Surface Combustion Corp., Toledo, Ohio

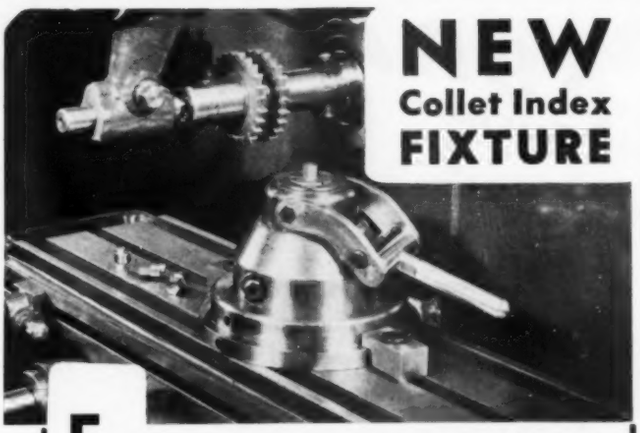
FURNACES, Melting
Hones, Inc., Chas. A., Baldwin, N. Y.

FURNACES, Oil Fired
Electric Furnace Co., Salem, Ohio

FURNACES, Soldering
Hones, Inc., Chas. A., Baldwin, N. Y.

FURNITURE, Machine Shop
New Britain-Gridley Machine Co., New Britain, Conn.

GAGE BLOCKS
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Webber Gage Co., Cleveland



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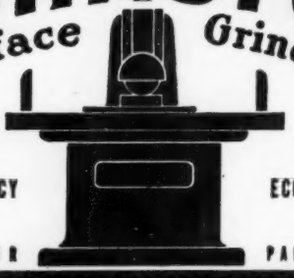

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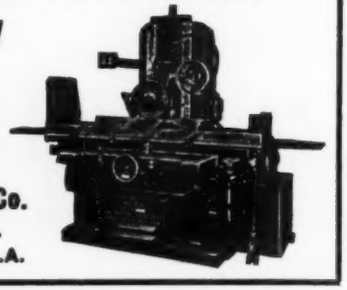

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Sheffield Gage Co., Dayton, Ohio

GAGES, Comparator
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Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., George, New York, N. Y.
Sheffield Gage Co., Dayton, Ohio

GAGES, Depth
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Gage Co., Dayton, Ohio

GAGES, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Sheffield Gage Co., Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.

GAGES, Gear
Sheffield Gage Co., Dayton, Ohio

GAGES, Plug and Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
Crafts Co., Inc., Arthur A., Boston
Hanson-Whitney Machine Co., Hartford, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Co., Dayton, Ohio

GAGES, Pressure
Sheffield Gage Co., Dayton, Ohio

GAGES, Snap and Cylindrical
Brown & Sharpe Mfg. Co., Providence, R. I.
Hanson-Whitney Machine Co., Hartford, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Co., Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Williams & Co., J. H., Buffalo, N. Y.

GAGES, Standard
Hanson-Whitney Machine Co., Hartford, Conn.

GAGES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.
Sheffield Gage Co., Dayton, Ohio

GAGES, Taper
Brown & Sharpe Mfg. Co., Providence, R. I.
Sheffield Gage Co., Dayton, Ohio

GAGES, Temperature
Sheffield Gage Co., Dayton, Ohio

GAGES, Thickness
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Gage Co., Dayton, Ohio

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Gage Co., Dayton, Ohio

GEAR BURNISHING MACHINES
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Gleason Works, Rochester, N. Y.

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Lees-Bradner Co., Cleveland
National Broach & Machine Co., Detroit
Newark Gear Cutting Machine Co., Newark, N. J.
Scherr Co., George, New York, N. Y.

GEAR HOBBING MACHINES
Cleveland Hobbing Machine Co., Cleveland, Ohio

GEAR LAPPING MACHINES
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National Broach & Machine Co., Detroit

GEAR MEASURING MACHINES
Fellows Gear Shaper Co., Springfield, Vt.
National Broach & Machine Co., Detroit

GEAR SHAVING MACHINES
National Broach & Machine Co., Detroit

GEAR TEMPERING MACHINES
Gleason Works, Rochester, N. Y.

GEAR TESTING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Lees-Bradner Co., Cleveland
National Broach & Machine Co., Detroit

GEARS, Cast
Braun Gear Corp., Brooklyn, N. Y.
Ganschow Gear Co., Chicago, Ill.
Grant Gear Works, Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.

GEARS, Cut
Adams Co., Dubuque, Ia.
Braun Gear Corp., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Earle Gear & Machine Co., Philadelphia, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Ganschow Gear Co., Chicago, Ill.
Gear Specialties Inc., Chicago, Ill.
Gleason Works, Rochester, N. Y.
Grant Gear Works, Boston, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Meisel Press Mfg. Co., Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.

GEARS, Non-Metallic
Bakelite Corp., N. Y. C.
General Electric Co., Schenectady, N. Y.
Perkins Mach. & Gear Co., Springfield, Mass.

GOGGLES, Safety
American Optical Co., Southbridge, Mass.

GREASE
Sun Oil Co., Philadelphia, Pa.

GRINDERS, Carbide Tool
Excello Corp., Detroit

GRINDERS, Electric
Hobart Brothers, Troy, Ohio

GRINDERS, Precision Thread
Jones & Lamson Machine Co., Springfield, Vt.

GRINDING HEADS
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINE ATTACHMENTS
Cincinnati Grinders, Incorporated, Cincinnati, Ohio
Liberty Tool & Gage Works, Providence, R. I.
Norton Co., Worcester, Mass.

GRINDING MACHINES, Centerless
Cincinnati Grinders, Incorporated, Cincinnati, Ohio

GRINDING MACHINES, Chaser
Landis Mach. Co., Waynesboro, Pa.

GRINDING MACHINES, Chucking
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

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Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Milling Mach. Co., Cincinnati, Ohio
Gallmeyer & Livingston Co., Grand Rapids, Mich.
General Machinery Corp., Boston
Geometric Tool Co., New Haven, Conn.
Heald Mach. Co., Worcester, Mass.
Kearney & Trecker Corp., Milwaukee
Landis Tool Co., Waynesboro, Pa.
Le Blond Machine Tool Co., R. K., Cincinnati, Ohio
Norton Co., Worcester, Mass.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Machine Co., Greenfield, Mass.
Sellers & Co. Inc., Wm., Philadelphia
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Cylinder
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Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Cylindrical
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Incorporated, Cincinnati, Ohio
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Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

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Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Mach. Co., Worcester, Mass.
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston

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Sellers & Co. Inc., Wm., Philadelphia

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Norton Co., Worcester, Mass.

GRINDING MACHINES, Gage
Abrasive Mach. Tool Co., E. Providence, R. I.
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Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING MACHINES, Hole and Face
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES, Hydraulic
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Grinders, Incorporated, Cincinnati, Ohio
Norton Co., Worcester, Mass.

GRINDING MACHINES, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder, Inc., Boston

GRINDING MACHINES, Piston Ring
Heald Mach. Co., Worcester, Mass.

GRINDING MACHINES, Plain
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Incorporated, Cincinnati, Ohio
Norton Co., Worcester, Mass.

GRINDING MACHINES, Pulley
Abrasive Mach. Tool Co., E. Providence, R. I.

GRINDING MACHINES, Radius
Van Norman Machine Tool Co., Springfield, Mass.

GRINDING MACHINES, Roll
Cincinnati Grinders, Incorporated, Cincinnati, Ohio

GRINDING MACHINES, Spline
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDING MACHINES, Surface
Abrasive Mach. Tool Co., E. Providence, R. I.
Blanchard Machine Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Mach. Co., Worcester, Mass.
Norton Co., Worcester, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Walker Co., O. S., Worcester, Mass.

GRINDING MACHINES, Tap
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Jones & Lamson Machine Co., Springfield, Vt.
Oliver Instrument Co., Adrian, Mich.

GRINDING MACHINES, Toolroom
Bryant Chucking Grinder Co., Springfield, Vt.
Norton Co., Worcester, Mass.
Production Machine Co., Greenfield, Mass.

GRINDING MACHINES, Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Incorporated, Cincinnati, Ohio
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Le Blond Machine Tool Co., R. K., Cincinnati, Ohio
Norton Co., Worcester, Mass.

GRINDING MACHINES, Vertical
Blanchard Machine Co., Cambridge, Mass.
Cincinnati Bickford Tool Co., Cincinnati, Ohio

GRINDING WHEELS
Blanchard Machine Co., Cambridge, Mass.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div., Tiffin, Ohio

GROUND FLAT STOCK
Brown & Sharpe Mfg. Co., Providence, R. I.

GUARDS, Gear
Littleford Bros., Cincinnati

HACK SAW BLADES
Capewell Mfg. Co., Hartford, Conn.

HAMMERS, Power
Sellers & Co. Inc., Wm., Philadelphia

HANDLES, Crank & Machine
Williams & Co., J. H., Buffalo, N. Y.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R. I.

HARDNESS MEASURING INSTRUMENTS
Shore Instrument & Mfg. Co., Jamaica, N. Y.
Wilson Mechanical Instrument Co., New York, N. Y.

HEADS, Milling
Kempsmith Machine Co., Milwaukee

HEAT TREATING
Excello Corp., Detroit
Surface Combustion Corp., Toledo, Ohio

HELMETS and SHIELDS, Welding
American Optical Co., Southbridge, Mass.

HOBBING MACHINES
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Barber-Colman Co., Rockford, Ill
Scherr Co., George, New York, N. Y.

HOBBING MACHINES, Gear
Cleveland Hobbing Machine Co., Cleveland, Ohio

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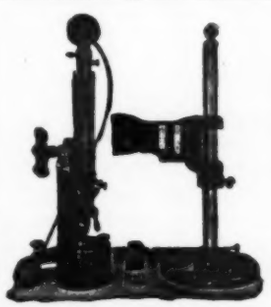
Hanson-Whitney Machine Co., Hartford, Conn.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

HOISTS, Hand
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Wright Mfg. Co. Div. of American Chain & Cable Co., Inc., York, Pa.

HONING MACHINES
Barnes Drill Co., Rockford, Ill.
Sunnen Products Co., St. Louis, Mo.



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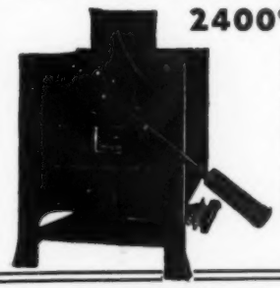

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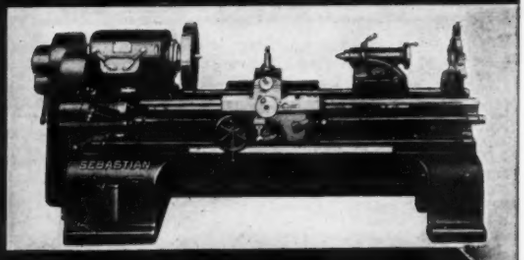

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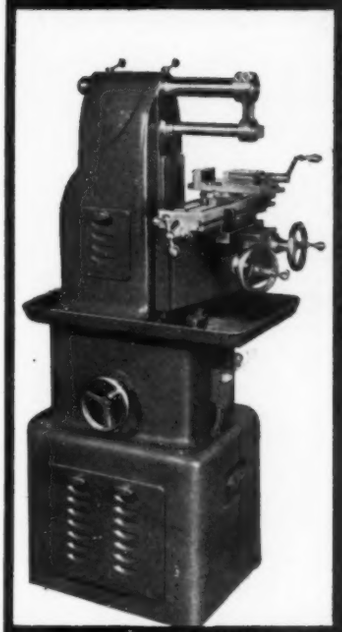

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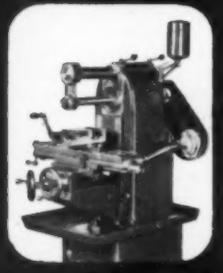

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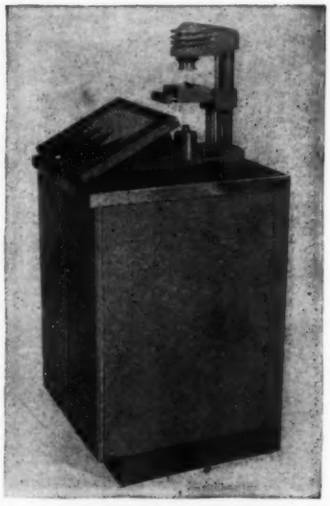

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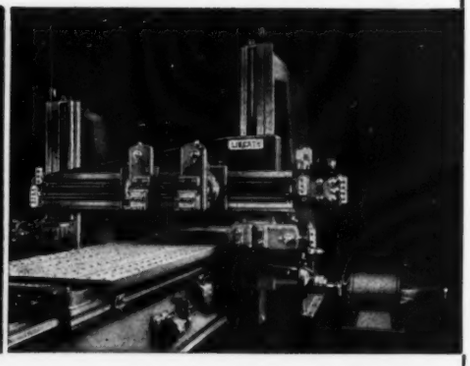

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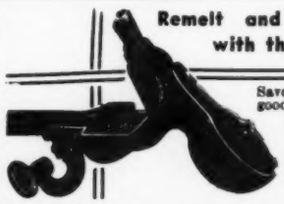

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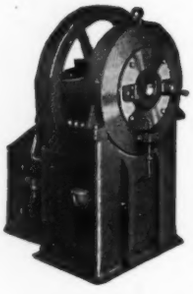

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29th Annual

Review & Catalog Number

Published January 22nd

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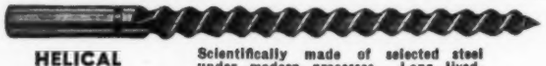

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Grant Mfg. & Mach. Co., Bridgeport, Conn.
Linley Brothers Co., Bridgeport, Conn.

ROLLS, Bending & Straightening
Cleveland Punch & Shear Works, Cleveland

ROPE, Wire
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

SAWING MACHINES, Band
Armstrong-Blum Mfg. Co., Chicago

SAWING MACHINES, Circular Saw
Porter-McLeod Machine Tool Co., Hatfield, Mass.

SAWING MACHINES, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Earle Gear & Machine Co., Philadelphia, Pa.

SAWS, Circular, Metal Cutting
Disston & Sons Inc., Henry, Philadelphia

SAWS, Hack Frames & Blades
Disston & Sons Inc., Henry, Philadelphia

SAWS, Metal Cutting, Band (Machine)
Capewell Mfg. Co., Hartford, Conn.

SAWS, Milling
Barber-Colman Co., Rockford, Ill.
Disston & Sons Inc., Henry, Philadelphia
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

SAWS, Power Hack
Disston & Sons Inc., Henry, Philadelphia

SAWS, Screw Slotting
Disston & Sons Inc., Henry, Philadelphia
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

SCREW DRIVERS, Automatic
Errington Mech. Lab., Staten Island, N. Y.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland

SCREW MACHINE TOOLS & ATTACHMENTS
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

SCREW MACHINE WORK
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES
Allen Mfg. Co., Hartford, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastern Mach. Screw Corp., New Haven, Conn.
Warner & Swasey Co., Cleveland

SCREW MACHINES, Automatic & Semi-Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., Cleveland, Ohio
Cone Automatic Machine Co., Windsor, Vt.
National Acme Co., Cleveland, Ohio
New Britain-Gridley Machine Co., New Britain, Conn.
Warner & Swasey Co., Cleveland

SCREW MACHINES, Plain or Hand
Cleveland Automatic Machine Co., Cleveland, Ohio
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Vt.

SCREW PLATES
Butterfield Division Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.

SCREW THREADING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.

SCREWS, Cap and Set
Allen Mfg. Co., Hartford, Conn.
Danly Mach. Specialties Co., Inc., Chicago, Ill.
Eastern Mach. Screw Corp., New Haven, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Recessed Head
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Safety
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Shoulder
Allen Mfg. Co., Hartford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

SHAPERS
American Tool Wks. Co., Cincinnati
Cincinnati Shaper Co., Cincinnati
Hanson-Whitney Machine Co., Hartford, Conn.
Henley Machine Co., Torrington, Conn.
Machinery Manufacturing Co., Los Angeles, Calif.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Smith & Mills Co., Cincinnati, Ohio.

SHARPENING STONES
Norton Co., Worcester, Mass.

SHEARS, Power
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Works, Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
Mitts & Merrill, Saginaw, Mich.
Niagara Machine & Tool Works, Buffalo, N. Y.

SHEAVES, V Belt
Allis-Chalmers Mfg. Co., Milwaukee

SHEET METAL WORKING MACHINERY
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Works, Cleveland
Niagara Machine & Tool Works, Buffalo, N. Y.

SHELL MAKING MACHINERY
Bullard Co., Bridgeport, Conn.
Coulter Machine Co., James, Bridgeport, Conn.

SLOTTING MACHINES
Consolidated Mach. Tool Corp., Rochester, N. Y.

SOAPS, Germicidal
Sugar Beet Products Co., Saginaw, Mich.

SOCKETS
Cleveland Twist Drill Co., Cleveland
Union Twist Drill Co., Athol, Mass.

SOCKETS, Detachable Head
Armstrong Bros. Tool Co., Chicago
Owatonna Tool Co., Owatonna, Minn.
Williams & Co., J. H., Buffalo, N. Y.

WHERE-TO-BUY DIRECTORY

SPECIAL MACHINES
Coulter Machine Co., James, Bridgeport, Conn.
Liberty Tool & Gage Works, Providence, R. I.
Snyder Tool & Engineering Co., Detroit, Mich.

SPEED REDUCERS
Adams Co., Dubuque, Iowa
Cullman Wheel Co., Chicago, Ill.
Earle Gear & Machine Co., Philadelphia, Pa.
Grant Gear Works, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SPEED REDUCERS, Motorized
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SPINDLES, Grinding
Excello Corp., Detroit

SPOT WELDER CONTROL
General Electric Co., Schenectady N. Y.

SPROCKETS
Cullman Wheel Co., Chicago, Ill.
Grant Gear Wks., Boston, Mass.

SQUARES
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

STAMPS, Steel
Noble & Westbrook Mfg. Co., Hartford, Conn.

STEEL, Carbon
Timken Roller Bearing Co., Canton, Ohio

STEEL, High Speed
Armstrong Bros. Tool Co., Chicago
Boker & Co., Inc., New York, N. Y.

STEEL SETTERS
Errington Mech. Lab., Staten Island N. Y.

STEEL, Tool
Armstrong Tool Co., Chicago

STRAIGHT EDGES
Brown & Sharpe Mfg. Co., Providence, R. I.

STRAIGHTENING MACHINERY
Springfield Mach. Tool Co., Springfield, Ohio

STUD SETTERS
Modern Tool Works, Rochester, N. Y

SUB PRESSES AND DIES
Danly Mach. Specialties Co., Inc., Chicago, Ill.
Waltham Machine Works, Waltham Mass.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R. I.

SWAGING MACHINES
Etna Machine Co., Toledo, Ohio
Torrington Co., Torrington, Conn.

SWITCHES
Square D Co., Milwaukee.

TAPER PINS
Pratt & Whitney Div. Niles-Bement Pond Co., Hartford, Conn.

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TAP HOLDERS
Errington Mech. Lab., Staten Island, N. Y.

TAPPING MACHINES AND ATTACHMENTS
Armstrong-Blum Mfg. Co., Chicago
Barber-Colman Co., Rockford, Ill.
Baush Machine Tool Co., Springfield, Mass.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Errington Mech. Lab., Staten Island, N. Y.
Haskins Co., R. G., Chicago, Ill.
Kingsbury Mach. Tool Corp., Keene, N. H.
Murchey Machine & Tool Co., Detroit
National Automatic Tool Co., Richmond, Ind.

TAPPING MACHINES, Single & Multi-Spindle
Baker Brothers, Inc., Toledo, Ohio

TAPS AND DIES
Card Mfg. Co., S. W., Mansfield, Mass.
Geometric Tool Co., New Haven, Conn.
Hanson-Whitney Machine Co., Hartford, Conn.
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

TAPS, Ground
Butterfield Division Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Wood & Spencer Co., Cleveland.

TAPS, Collapsing
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.

TESTING APPARATUS, Hardness
Shore Instrument & Mfg. Co., Jamaica, N. Y.
Wilson Mechanical Instrument Co., New York, N. Y.

THERMOCOUPLES
Brown Instrument Co., Philadelphia

THREAD CUTTING MACHINES
Eastern Mach. Screw Corp., New Haven, Conn.
Excello Corp., Detroit
Geometric Tool Co., New Haven Conn.
Grant Mfg. & Mach. Co., Bridge-
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Waltham Machine Works, Waltham, Mass.
Warner & Swasey Co., Cleveland

THREAD CUTTING TOOLS
Eastern Mach. Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven, Conn.
Hanson-Whitney Machine Co., Hartford, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Murchey Machine & Tool Co., Detroit, Mich.
Peerless Machine Co., Racine, Wis.
Rivett Lathe & Grinder, Inc., Boston, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Mechanically simple and easy to operate, a man can become expert in an hour or so of operation. Quiet—no noisy reversing mechanism nor slinging of oil. Can be plugged in any light socket. For full information write for bulletin.

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Size of machine—16 in. x 7 in. x 22 in. high
Weight—Approx. 60 pounds

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WONDER WHERE YOU CAN FIND OUTSIDE HELP?

AMERICAN MACHINIST is now preparing a new and enlarged DIRECTORY OF CONTRACT WORK FACILITIES to appear in the January 22 Annual Review & Catalog number. This DIRECTORY is a unique feature of this issue—keep it throughout the year for ready reference. It can simplify your task when you need outside help and your usual sources are filled up.

AMERICAN MACHINIST stands ready and willing to help you locate the facilities you need and this DIRECTORY is an important step towards this goal. Watch for it in our January 22 Annual Review & Catalog number!

CONTRACT WORK DEPARTMENT
American Machinist, 330 W. 42d St., N. Y. C.

WHERE-TO-BUY DIRECTORY

THREADERS, Pipe
Armstrong Bros. Tool Co., Chicago
Peerless Machine Co., Racine, Wis.
Warner & Swasey Co., Cleveland

TONGS, Lifting
Armstrong Bros. Tool Co., Chicago

TOOL BITS
Cleveland Twist Drill Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
McKenna Metals Co., Latrobe, Pa.
Warner & Swasey Co., Cleveland

TOOL-CRIB CONTROL SYSTEMS
McCaskey Register Co., Alliance, Ohio

TOOL HOLDERS
Armstrong Bros. Tool Co., Chicago
Auto Ordnance Corp., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield, Vt.
Ready Tool Co., Bridgeport, Conn.
Warner & Swasey Co., Cleveland, Ohio
Williams & Co., J. H., Buffalo, N. Y.

TOOL POSTS, Lathe
Williams & Co., J. H., Buffalo, N. Y.

TOOL STANDS
Standard Pressed Steel Co., Jenkintown, Pa.

TOOLS, Boring
Armstrong Bros. Tool Co., Chicago
Bullard Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
McKenna Metals Co., Latrobe, Pa.
Warner & Swasey Co., Cleveland.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Carbide Alloy
Crafts & Co., Inc., Arthur A., Boston, Mass.
Jones & Lamson Machine Co., Springfield, Vt.
Tungsten Electric Co., North Bergen, N. J.
Warner & Swasey Co., Cleveland

TOOLS, Cutting-Off
Armstrong Bros. Tool Co., Chicago
Firth Sterling Steel Co., McKeesport Pa.
Jones & Lamson Machine Co., Springfield, Vt.
McKenna Metals Co., Latrobe, Pa.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Diamond Tipped
Diamond Tool Co., (Not Inc.) Chicago
Koebel Diamond Tool Co., Detroit.

TOOLS, Hand
Capewell Mfg. Co., Hartford, Conn.

TOOLS, Knurling
Armstrong Bros. Tool Co., Chicago
Warner & Swasey Co., Cleveland.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Lathe
Bullard Co., Bridgeport, Conn.
Cleveland Twist Drill Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
McKenna Metals, Latrobe, Pa.
Warner & Swasey Co., Cleveland

TOOLS, Lathe, Shaper and Planer
Armstrong Bros. Tool Co., Chicago
Firth Sterling Steel Co., McKeesport, Pa.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Pipe Threading
Armstrong Bros. Tool Co., Chicago
Warner & Swasey Co., Cleveland

TOOLS, Safety
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Thread Cutting
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Tungsten Carbide Tipped
Crafts Co., Arthur A., Boston, Mass.
Firth Sterling Steel Co., McKeesport, Pa.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., Cleveland

TOOLS, Turning
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Turret Lathe and Screw Machine
Armstrong Bros. Tool Co., Chicago
Firth Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., Cleveland

TRANSFORMERS
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TRANSMISSION EQUIPMENT
Oilgear Co., Milwaukee

TRANSMISSION, Variable Speed
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TRUCKS, Hand
Standard Pressed Steel Co., Jenkintown, Pa.

TRUCKS, Steel
Standard Pressed Steel Co., Jenkintown, Pa.

TUNGSTEN CARBIDE TOOLS
Warner & Swasey Co., Cleveland

TURBINES, Steam
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURRETS, Tool-Post
American Tool Wks. Co., Cincinnati
Gisholt Machine Co., Madison, Wis
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., Cleveland

UNIT HEATERS, Gas Fired
Surface Combustion Corp., Toledo, Ohio

UNIVERSAL JOINTS
Baush Machine Tool Co., Springfield, Mass.
Gray & Prior Machine Co., Hartford, Conn.

USED MACHINERY
Aaron Machry. Co., New York, N. Y.
Atlantic Machinery Corp., New York
Beal & Co., Joseph, Boston, Mass.
Bennett-Pofken Machine Tool Co. Inc., N. Y. C.
Central Mach. Tool Corp., Toledo, O.
Cincinnati Mach. & Supply Co., Cincinnati, O.
Dony Machry. Co., D. E., Rochester
Dulein Steel Prod. Co. Inc., Fresno, Calif.
Eastern Machinery Co., Cincinnati
Emerman & Co., Louis E., Chicago
Falk Machinery Co., Rochester, N. Y.
Galbreath Machinery Co., Pittsburgh, Pa.
Globe Machinery Co., Chicago.
Globe Machinery Co., N. Y. C.
Hackett Co., J. Lee, Detroit.
Hill-Clarke Machinery Co., Chicago
Hyman & Sons, Jos., Philadelphia
Indianapolis Machinery & Supply Co., Indianapolis, Ind.
Iroquois Machy. Co., Buffalo, N. Y.
Jones Machine Tool Co., Cincinnati
Lang Machinery Co., Pittsburgh, Pa.
Lucus & Son, J. H., Bridgeport, Conn.
Miles Machy. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., New York, N. Y.
New York Machinery Co., N. Y. C.
O'Brien Machinery Co., Phila., Pa.
Osborne & Sexton Machy. Co., Columbus, Ohio
Ott Mach. Sales Co., Detroit, Mich.
Reconstruction Machine Tool Corp., N. Y. C.
Rosencranz Machinery Co., N. Y. C.
Simmons Machine Tool Corp., Albany
Sun Machry. Co., Newark, N. J.
West Penn Machinery Co., Pittsburgh, Pa.
Wigglesworth & Co., T. R., Cleveland, O.
Zeeve & Co., Alex, New York, N. Y.

V BELTS
Allis-Chalmers Mfg. Co., Milwaukee

VERNIERS
Brown & Sharpe Mfg. Co., Providence, R. I.

VISE STANDS
New Britain-Gridley Machine Co., New Britain, Conn.

VISES, Drilling Machine
Armstrong Bros. Tool Co., Chicago
Hartford Special Machy. Co., Hartford, Conn.
Johnson Tool Co., East Providence, R. I.

VISES, Machinist
Desmond-Stephan Mfg. Co., Urbana, Ohio
Wiedemann Machine Co., Phila, Pa.

VISES, Milling Machines
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio
Hartford Special Machy. Co., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee

VISES, Pipe
Armstrong-Blum Mfg. Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

WASHING MACHINES, Metal
Alvey-Ferguson Co., 71 Disney St., Cincinnati, O.

WELDERS, Arc
Hobart Bros., Troy, Ohio

WELDING ELECTRODES
General Electric Co., Schenectady, N. Y.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.

WELDING MACHINES, Electric Arc
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING RODS
Hobart Brothers, Troy, Ohio

WELDING SUPPLIES, Electric
General Electric Co., Schenectady, N. Y.

WIRE, Iron, Steel & Copper
Roebling's Sons Co., John A., Trenton, N. J.

WIRE & CABLE, Insulated
General Electric Co., Schenectady, N. Y.

WOODWORKING MACHINERY
Barnes W. F. & John Co., Rockford, Ill.

WORM DRIVES
Gear Specialties, Inc., Chicago, Ill.
Perkins Mach. & Gear Co., Springfield, Mass.

WORMS
Gear Specialties, Inc., Chicago, Ill.

WRENCHES, Chain
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Drop Forged
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Machinist
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Pipe
Armstrong Bros. Tool Co., Chicago

WRENCHES, Ratchet
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Socket
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Tap
Butterfield Division Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DIAMONDS for Defense

NEW DIAMOND NIB

BIG-HED "Loc-Key-Set" (Pat. Pend) Nibs always provide better dressing and truer, sharper wheels because they dress cooler, permit closer tolerances. Diamond cannot shift and slug will not slip because new Loc-Key-Set feature locks diamond-holding slug to Nib with unique internal key construction, permitting micrometer control of tool pass.

PAT. PEND.

BIG-HED "Loc-Key-Set" Nibs are now in stock at our local service and stock branch. Loc-Key-Set construction now used in all D. T. Co. Diamond Dressing Tools. Call or write for details.

DIAMOND TOOL CO., Not Inc.
938 E. 41st Street CHICAGO, ILL.

Continuous Operation is easy with "Simplified" ARC WELDING
Speeds UP PRODUCTION
free!
WRITE TODAY FOR THIS VALUABLE BOOK
HOBART
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BROTHERS CO., BOX AM-122 TROY, OHIO

Chips

After 35 Years . . . Excerpt from a just-received letter from 35-year reader O. C. Hedin, chief research engineer of The Weldon Tool Company "I am not going to say that *American Machinist* is the only good trade journal, but I can say very honestly and sincerely that from the very start I realized it was the one publication from which I could get a great amount of help if I applied myself. For it was

and still is an up-to-the-minute magazine, out getting the information for us fellows who are busy and cannot readily get about. Yes, I feel the *American Machinist* has done much to help mechanics help themselves, besides being always at it trying to push the mechanical trade up another notch. Possibly it is in order to say at this time to a proven friend, 'Thanks for the lift'."

Management is the art of knowing when to BREAK a rule.

The Magic 7th . . . A French writer says that "The reader of a newspaper does not see the first insertion of an ordinary advertisement; the second he sees, but does not read; the third insertion he reads; the fourth insertion, he looks at the price; the fifth insertion, he speaks of it to his wife; the sixth insertion, he is ready to purchase, and the seventh insertion, he purchases". Your object is to make the public understand what you have got to sell, and if you have not the pluck to keep advertising, until you have imparted that information, all the money you have spent is lost.—*P. T. Barnum*, "The Art of Money Getting" (lecture).

Anyone can do it right—THE SECOND TIME!

With the Mostest . . . For several years, we have been making periodic use of that famous battle-winning formula of General Forrest's "Git thar fustest with the mostest men . . ." Makes good sloganeering about our circulation, which continues to be Metal-Working's largest net paid by the expected margin of several thousands. But only last Sunday we discovered what purports to be the entire quotation, which is well worth repeating. It was "Find out whar all Hell's goin' to bust loose next, and git thar fust with the mostest men!" That's what we're doing—as evidenced by our latest survey of Metal-Working defense-contract plants. We go to buyers in 89.6% by number, considerably over that by proportion of business done.

The successful man does as he pleases. But he's darn careful what pleases him.

Buffalo Hunt . . . The citizens of New York were invited to attend a "Free, Great Buffalo Hunt" on the Hoboken race course, Aug. 31, 1843. 24,000 of them crossed the river to see a herd of approximately 50 yearling buffalo pushed around by an old hunter. Everybody had a good time, and they didn't find out until three days later that Barnum had staged the whole thing as advertising for his museum. They never did find out that on that fateful day Barnum had chartered all New York ferry boats, so collected 48,000 sixpence for his *free* entertainment and got all the advertising value to boot.

". . . Which Knew Not Joseph" . . . You may recall the biblical story of Joseph, who, sold to slavery by his jealous brothers because of his "coat of many colors", rose to be a power in Egypt. His rise was rapid and he eventually sent for his father and brothers, to support them through the hard times. He was second only to the king. But then Joseph died. And Pharaoh died, and "there arose up a new king over Egypt, which knew not Joseph." What happened then to Joseph's relatives and friends?

We're reminded of that story by current changes in industry. Tens of thousands of new men are coming in, and executive personnel is being pushed around as a result. Our Direct Mail Division checked up on 5,000 companies, comparing the names

of executives in 1939 and today. Of the companies, 61% showed changes. Specifically, the changes were:

Title	*% Change*
Presidents	11
Vice-presidents	19
General Managers	14.5
Sales Managers	23.5
Production Mgrs. & Supts.	29.5
Design Engineers	22

There is sound evidence of the need for continued advertising, regardless of sales levels—to make the new "kings" know your company and your products.—E.J.T.

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